6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 300

EPA-HQ-SFUND-1995-0005; FRL-XXXX-X

National Oil and Hazardous Substances Pollution Contingency Plan;

National Priorities List: Deletion of the Tennessee Products Superfund Site

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA) Region 4 announces the deletion of the Tennessee Products Superfund Site (Site) located in Chattanooga, Tennessee, from the National Priorities List (NPL). The NPL, promulgated pursuant to section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, is an appendix of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The EPA and the State of Tennessee, through the Tennessee Department of Environment and Conservation, have determined that all appropriate response actions under CERCLA, other than Five Year Reviews, have been completed. However, this deletion does not preclude future actions under Superfund.

DATES: This action is effective [Insert date of publication in the Federal Register].

ADDRESSES:

Docket: EPA has established a docket for this action under Docket Identification No. EPA-HQ-SFUND-1995-0005. All documents in the docket are listed on the http://www.regulations.gov Web site. Although listed in the index, some information is not publicly available, i.e., Confidential Business Information or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically through http://www.regulations.gov or in hard copy at the Site information repositories. Locations, contacts, phone numbers and viewing hours are:

U.S. EPA Region 4
Superfund and Emergency Management Division
61 Forsyth Street, SW
Atlanta, Georgia 30303
Hours: Monday through Friday, 9:00 am to 5:00 pm

Tennessee Department of Environment and Conservation
Division of Remediation
1301 Riverfront Parkway, Suite 206
Chattanooga, Tennessee 37402
Hours: Monday through Friday, 9:00 am to 5:00 pm
Phone 423-634-5745

FOR FURTHER INFORMATION CONTACT: Craig Zeller, Remedial Project Manager, U.S. Environmental Protection Agency, Region 4, 61 Forsyth Street, SW Atlanta, Georgia 30303, 404-562-8827, email: zeller.craig@epa.gov.

SUPPLEMENTARY INFORMATION:

The site to be deleted from the NPL is: Tennessee Products, Chattanooga, Tennessee. A Notice of Intent to Delete for this Site was published in the **Federal Register** (84 FR 20073) on May 8, 2019.

The closing date for comments on the Notice of Intent to Delete was June 7, 2019. No public comments were received.

EPA maintains the NPL as the list of sites that appear to present a significant risk to public health, welfare, or the environment. Deletion from the NPL does not preclude further remedial action. Whenever there is a significant release from a site deleted from the NPL, the deleted site may be restored to the NPL without application of the hazard ranking system. Deletion of a site from the NPL does not affect responsible party liability in the unlikely event that future conditions warrant further actions.

List of Subjects in 40 CFR Part 300

Environmental protection, Air pollution control, Chemicals, Hazardous waste, Hazardous substances, Intergovernmental relations, Penalties, Reporting and recordkeeping requirements, Superfund, Water pollution control, Water supply.

8/5/19
Dated

Mary S. Walker
Regional Administrator
Region 4

For reasons set out in the preamble, 40 CFR part 300 is amended as follows:

PART 300—NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN

1. The authority citation for part 300 continues to read as follows:

Authority: 33 U.S.C. 1321(d); 42 U.S.C. 9601–9657; E.O. 13626, 77 FR 56749, 3 CFR, 2013 Comp., p. 306; E.O. 12777, 56 FR 54757, 3 CFR, 1991 Comp., p. 351; E.O. 12580, 52 FR 2923, 3 CFR, 1987 Comp., p. 193.

Appendix B to Part 300 – [Amended]

2. Table 1 of Appendix B to part 300 is amended by removing "TN, Tennessee Products, Chattanooga."

Second Five-Year Review Report for Tennessee Products Superfund Site

EPA ID # TND071516959

Chattanooga
Hamilton County, Tennessee

September 2016

Prepared By:
TDEC-DoR.
1301 Riverfront Parkway, Suite 206
Chattanooga, Tennessee 37402

For:
United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by:

for
Franklin E. Hill
Director, Superfund Division

Date: 9/26/16

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List of Acronyms

4C	Chattanooga Creek Cleanup Committee, LLC
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BTEX	benzene, toluene, ethylbenzene, and xylenes
BWSC	Barge, Waggoner, Sumner and Cannon, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLP	Contract Laboratory Program
cm	centimeter
COCs	Chemicals of Concern
DDT	Dichlorodiphenyltrichloroethane
DNAPL	Dense Non-Aqueous Phase Liquid
DoR	Division of Remediation
EC's	Engineering Controls
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
ICs	Institutional Controls
LIF	Laser Induced Fluorescence
MCL	Maximum Contaminant Levels
mg/kg	milligrams per kilogram
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
ORD	Office of Research and Development
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated biphenyls
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SESD	Science and Ecosystems Support Division SESD
SI	Site Inspection

SPME	Solid Phase Micro Extraction
SWP	Southern Wood Piedmont
TAL	Target Analyte List
TBCs	To-Be-Considered Criteria
TEF	Toxicity Equivalence Factor
TEQ	Toxic Equivalency
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCL	Target Compound List
TDEC	Tennessee Department of Environment and Conservation
TDWQC	Tennessee Division of Water Quality Control
TPS	Tennessee Products Superfund Site
TVA	Tennessee Valley Authority

Executive Summary

Introduction

This is the second Five-Year Review (FYR) for the Tennessee Products Superfund Site (TPS). The triggering action for this statutory review is the completion date of the first FYR, which was September 27, 2011. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one Operable Unit, which was addressed in two remedial action phases of work, all of which are addressed in this FYR.

The TPS Site includes approximately a 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex and adjacent industrial facilities in an urban industrial and residential area of south Chattanooga were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of Chattanooga Creek sediments. Numerous discharges of contaminated water to Chattanooga Creek via tributaries were documented. Results of previous investigations and subsequent evaluations indicated that then existing conditions posed an unacceptable risk to human health, if exposure to the contaminated sediments were to occur.

The TPS Site is surrounded by mixed use areas, consisting of commercial, residential and industrial. Although most of the Site is fairly isolated and inaccessible to residents due to being surrounded by wooded floodplain, portions of the Site may be accessed by road crossings at two locations.
In order to minimize risks posed by the contaminants to human health and the environment, a remedy was chosen that consisted of a combination of the following: excavation, stabilization, treatment, recycling, offsite disposal and stream restoration. During the first phase of removal, emphasis was placed on waste-to-fuel recycling of the excavated and stabilized sediments. Due to changing economic conditions and associated cost constraints, the second phase of remedial work opted for chemical stabilization and offsite disposal of the excavated sediments in lieu of recycling. In situations where excavation was not practicable, the sediments were covered in place and physically stabilized.

Remedial Action Objectives

The Remedial Actions Objectives (RAO's), as specified in the Record of Decision (ROD) are:

- Minimize direct contact by the public and workers with soil and sediments containing excessive levels of Chemicals of Concern (COCs).

- Minimize direct contact by the public and workers with surface water containing excessive levels of COCs.

- Minimize direct contact by the public and workers with groundwater containing excessive levels of COCs.

- Minimize transport of contaminated soil and sediment by erosion to water courses, including the Tennessee River.

- Minimize potential for leaching of COCs to groundwater from areas of high concentration.

On November 23, 2010, EPA submitted official comments to TDEC on the planned modification of SWP's Post-Closure permit. The substance of those comments was that the modified permit should require SWP to take some regular action toward ensuring that the barrier in the creek remains effective. On June 13, 2011, and again on September 12, 2011, personnel from the EPA Region 4 Superfund Division met with representatives from Southern Wood Piedmont (SWP) and the Tennessee Department of Environment and Conservation (TDEC) Resource Conservation and Recovery Act (RCRA) Program to discuss the requirements of the TDEC RCRA Post Closure Permit for the SWP facility. EPA proposed to SWP and TDEC that future inspection and monitoring of the AquaBlok® cap performance should be included in the Final RCRA Post Closure Permit issued by TDEC. The Final permit for the SWP facility was issued November 17, 2011, and stipulated quarterly visual inspections of the AquaBlok® cap and annual Laser Induced Fluorescence (LIF) sampling of the cap.

Technical Assessment

Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. Therefore, the implemented remedy at the TPS remains protective of both human health and the environment.

Conclusion

Two years of SPME monitoring and four years of LIF monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Therefore, the remedy implemented at the Tennessee Products Site remains protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Tennessee Products		
EPA ID: TND071516959		
Region: 4	**State:** TN	**City/County:** Chattanooga/Hamilton County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**		
Author name (Federal or State Project Manager): Troy Keith (reviewed by EPA)		
Author affiliation: TDEC Division of Remediation		
Review period: 2/3/2016 – 9/27/2016		
Date of site inspection: 6/23/2016		
Type of review: Statutory		
Review number: 2		
Triggering action date: 09/27/2011		
Due date *(five years after triggering action date)*: 09/27/2016		

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
NA

Issues and Recommendations Identified in the Five-Year Review:
NA

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-Term Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. All inspections and sampling events conducted as of the time of this FYR indicate the AquaBlok® cap is functioning as intended. Therefore, the remedy at the Tennessee Products Site remains protective of human health and the environment, both in the short term and long term.	

Five-Year Review Summary Form (continued)

Environmental Indicators
- *Current human exposures at the Site are under control.*

Are Necessary Institutional Controls in Place?
☐ All ☐ Some ☒ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☒ Yes ☐ No

Has the Site Been Put into Reuse?
☒ Yes ☐ No

Second Five-Year Review Report
Tennessee Products Superfund Site

1.0 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency prepares FYRs pursuant to Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."

The Tennessee Department of Environment and Conservation (TDEC), Division of Remediation (DoR), conducted the FYR and prepared this report regarding the remedy implemented at the Tennessee Products Site (TPS) in Chattanooga, Hamilton County, Tennessee. This FYR was conducted from February 2016 to September 2016. EPA Region 4 is the lead agency for developing and implementing the remedy for the Potentially Responsible Party (PRP)-financed cleanup at the Site.

This is the second FYR for the Tennessee Products Site (Site). The triggering action for this statutory review is the completion date of the first FYR, which was September 27, 2011. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one Operable Unit, which was addressed in two remedial action phases of work, all of which are addressed in this FYR. Phase I was a non-time critical removal that took place in 1997 and 1998, prior to the ROD. The Phase II remedial action took place from 2005 through 2007, after the ROD was issued.

2.0 Site Chronology

The following table lists the dates of important events for the Tennessee Products Superfund Site.

Table 1: Chronology of Site Events

CHRONOLOGY OF EVENTS	
DATE	**DESCRIPTION OF EVENT**
June 1, 1981	Discovery
January 1, 1983	Preliminary Assessment
June 1, 1984	Site Inspection
November 2, 1990	Site Inspection
September 8 – October 10, 1993	Removal Action
January 18, 1994	Proposal to the National Priorities List (NPL)
September 29, 1995	Finalized on the NPL
June 24, 1997 – December 4, 1998	Removal Action
April 12, 2002	EPA and 4C enter into an Administrative Order on Consent for the Remedial Design/Remedial Action (RD/RA)
September 30, 2002	Remedial Investigation/Feasibility Study (RI/FS) completed Record of Decision (ROD) Signed
August 3, 2004	Explanation of Significant Difference (ESD)
May 4, 2005	RD/RA Consent Decree Filed
May 10, 2005	Barge, Waggoner, Sumner, and Cannon, Inc. (BWSC) Health and Safety Plan, Preconstruction Survey Work Plan, and Remedial Design Work Plan Submitted
May 27, 2005	Preliminary Design Drawings and Document Submitted
June 15, 2005	Envirocon Health and Safety Plan Submitted
June 22, 2005	Stakeholders Meeting Held
July 14, 2005	State of Tennessee Special Waste Application Submitted
July 26, 2005	Remedial Action Work Plan Submitted
August 2005	Access Agreements Reached with all Landowners
August 2, 2005	Storm Water Pollution Prevention Plan Submitted
September 6, 2005	Project Orientation and Mobilization to Site
September 20, 2005	Pre-Construction Meeting and Public Meeting Held
September 23, 2005	Project Quality Management Plan Submitted
October 3, 2005	Background Air Monitoring at Perimeter Completed
October 7, 2005	Final Design Drawings and Document Submitted
October 11, 2005	Background Air Samples Collected
October 11 – 20, 2005	Comparison Water Samples from Upstream of Project Limits Collected
October 12, 2005	Authorization to Proceed with Full Scale Remediation Received from EPA
October 26, 2005	Representative Samples from Northeast Tributary Area Prior to Excavation Collected

November 1, 2005	Project Status Presentation to Chattanooga City Council
November 2, 2005	Media Day Held
November 10, 2005	Verification of Performance Standard Obtainment for Station 12+75 to Station 22+50 (Stream Reach 1) Completed
December 1, 2005	Confirmation Samples from Northeast Tributary Area Collected
December 14, 2005	Verification of Performance Standard Obtainment for Station 60+00 to Station 61+00 (Bypass) Completed
December 27, 2005	Removal at Northeast Tributary Confirmed Complete
January 6, 2006	EPA and TDEC Performed Inspection of Changed Conditions (mobile Non-Aqueous Phase Liquid (NAPL)
January 31, 2006	Envirocon Demobilization for Winter Shutdown Complete (Security and Inspections Continue)
March 6 – 20, 2006	EPA Performs Site Investigation Related to NAPL
March 8, 2006	Envirocon Remobilization to Site; Winter Shutdown Concluded
May 24, 2006	Verification of Performance Standard Obtainment for Station 22+50 to Station 29+50 (Stream Reach 2) Completed
June 13, 2006	Verification of Performance Standard Obtainment for Station 29+50 to Station 40+00 (Stream Reach 2) Completed
June 20, 2006	Statement of Work Modified by EPA
June 22, 2006	Request to Modify Project Quality Management Plan Tab B-Performance Standards Verification Plan Submitted
July 8, 2006	Special Waste Recertification Submitted
July 28, 2006	Verification of Performance Standard Obtainment for Station 40+00 to Station 57+50 (Stream Reaches 3 & 4) Completed
August 29, 2006	EPA Approves the Use of AquaBlok® as an Isolation Barrier
September 1, 2006	Verification of Performance Standard Obtainment for Station 57+50 to Station 77+00 (Stream Reach 4) Completed
September 12, 2006	Verification of Performance Standard Obtainment for Station 77+00 to Station 80+00 (Stream Reach 4) Completed
September 15, 2006	Remedial Action Plan – Supplement for Modified Statement of Work and Project Quality Management Plan – Supplement for Modified Statement of Work Submitted and Notification by EPA for Suspension of Excavation Work in Reach 5 until 2007
November 28, 2006	Isolation Barrier Verification of Performance Standard Obtainment for Station for 45+00 to Station 80+00 Completed
December 15, 2006	Envirocon Demobilization for Winter Shutdown Complete (Security and Inspections Continue)
April 16, 2007	Envirocon Remobilization to Site; Winter Shutdown Concluded
May 21, 2007	Verification of Performance Standard Obtainment for Station 80+00 to Station 83+25 (Stream Reach 4) Completed
May 31, 2007	Verification of Performance Standard Obtainment for Station 83+25 to Station 85+25 (Stream Reach 4) Completed
June 8, 2007	Special Waste Recertification Submitted
June 14, 2007	Verification of Performance Standard Obtainment for Station 85+25 to Station 88+00 (Stream Reaches 4 & 5) Completed and

	Isolation Barrier Verification of Performance Standard Obtainment for Station for 80+00 to Station 83+25 Completed
June 21, 2007	Verification of Performance Standard Obtainment for Station 88+00 to Station 90+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 83+25 to Station 85+25 Completed
June 28, 2007	Verification of Performance Standard Obtainment for Station 90+00 to Station 93+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 85+25 to Station 88+00 Completed
July 11, 2007	Verification of Performance Standard Obtainment for Station 93+00 to Station 95+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 88+00 to Station 93+00 Completed
August 7, 2007	Verification of Performance Standard Obtainment for Station 95+00 to Station 100+00 (Stream Reach 5) Completed
August 14, 2007	Verification of Performance Standard Obtainment for Station 100+00 to Station 102+50 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 93+00 to Station 95+00 Completed
August 23, 2007	Isolation Barrier Verification of Performance Standard Obtainment for Station for 95+00 to Station 102+50 Completed and Pre-Final Construction Inspection Completed
September 6, 2007	Pre-Final Construction Report Submitted
September 13, 2007	Final Inspection Completed
September 14, 2007	Envirocon demobilizes from the Site
October 25, 2007	Public Meeting Held
September 26, 2008	Close Out Report
October 27,2009 through November 10, 2009	Samples Collected from Isolation Barrier
November 1, 2010 through November 17, 2010	Samples Collected from Isolation Barrier
September 27, 2011	First Five Year Review
May 2012	Samples Collected from Isolation Barrier
May 2013	Samples Collected from Isolation Barrier
May 2014	Samples Collected from Isolation Barrier
May 2015	Samples Collected from Isolation Barrier
February 3, 2016	Scoping Meeting
June 23, 2016	Site Inspection
July 13, 2016	Public Notice

3.0 Background

3.1 Physical Characteristics

Chattanooga Creek originates from the slopes of Lookout Mountain in Georgia, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River upstream of Nickajack Reservoir. The creek is a gaining stream throughout its course. The majority of tributaries enter the creek in Georgia with the exception of Dobbs Branch, which enters Chattanooga Creek three miles upstream of the mouth of the creek. Figure 1 depicts the location of the Tennessee Products Superfund (TPS) Site in relation to regional and local surroundings. Figure 2 depicts the TPS site, via aerial photo coverage, in relation to its immediate surroundings.

The TPS Site includes approximately a 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex and adjacent industrial facilities in an urban industrial and residential area of south Chattanooga were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of Chattanooga Creek sediments. Numerous discharges of contaminated water to Chattanooga Creek via tributaries were documented. Results of previous investigations and subsequent evaluations indicated that existing conditions posed an unacceptable risk to human health, if exposure to the contaminated sediments were to occur.

The TPS Site is surrounded by mixed use areas, consisting of commercial, residential and industrial. Although most of the Site is fairly isolated and inaccessible to residents due to being surrounded by wooded floodplain, portions of the Site may be accessed by road crossings at two locations.
The only environmentally sensitive areas associated with the site are the wetlands that occupy topographically low areas of the adjacent floodplain. Chattanooga Creek is an impaired stream (303D) as a result of upstream agricultural runoff and other anthropological inputs, such as junk yards and sewer overflows.

Figure 1: Location Map for the Tennessee Products Superfund Site

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding the EPA's response actions at the site, and is not intended for any other purpose."

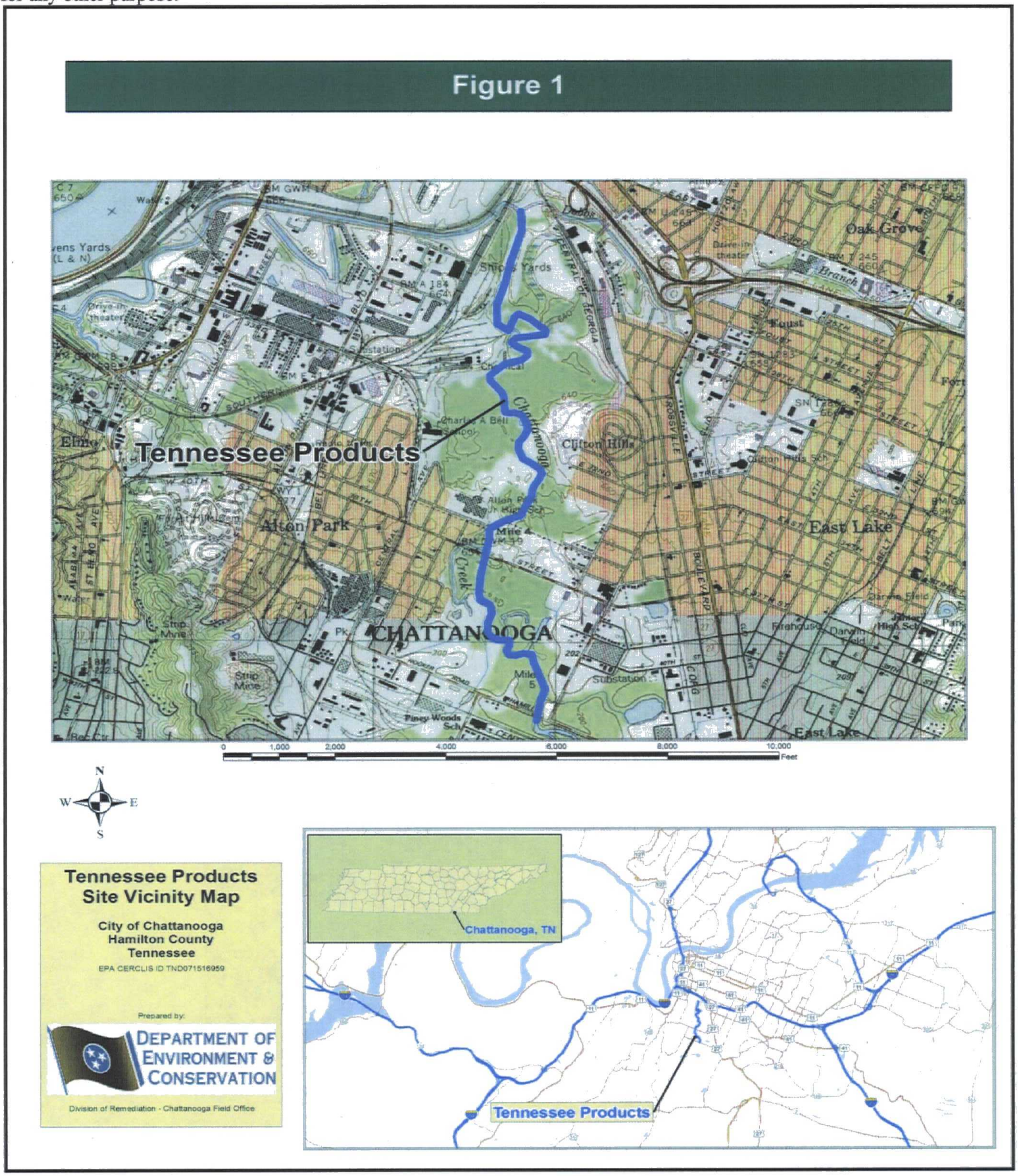
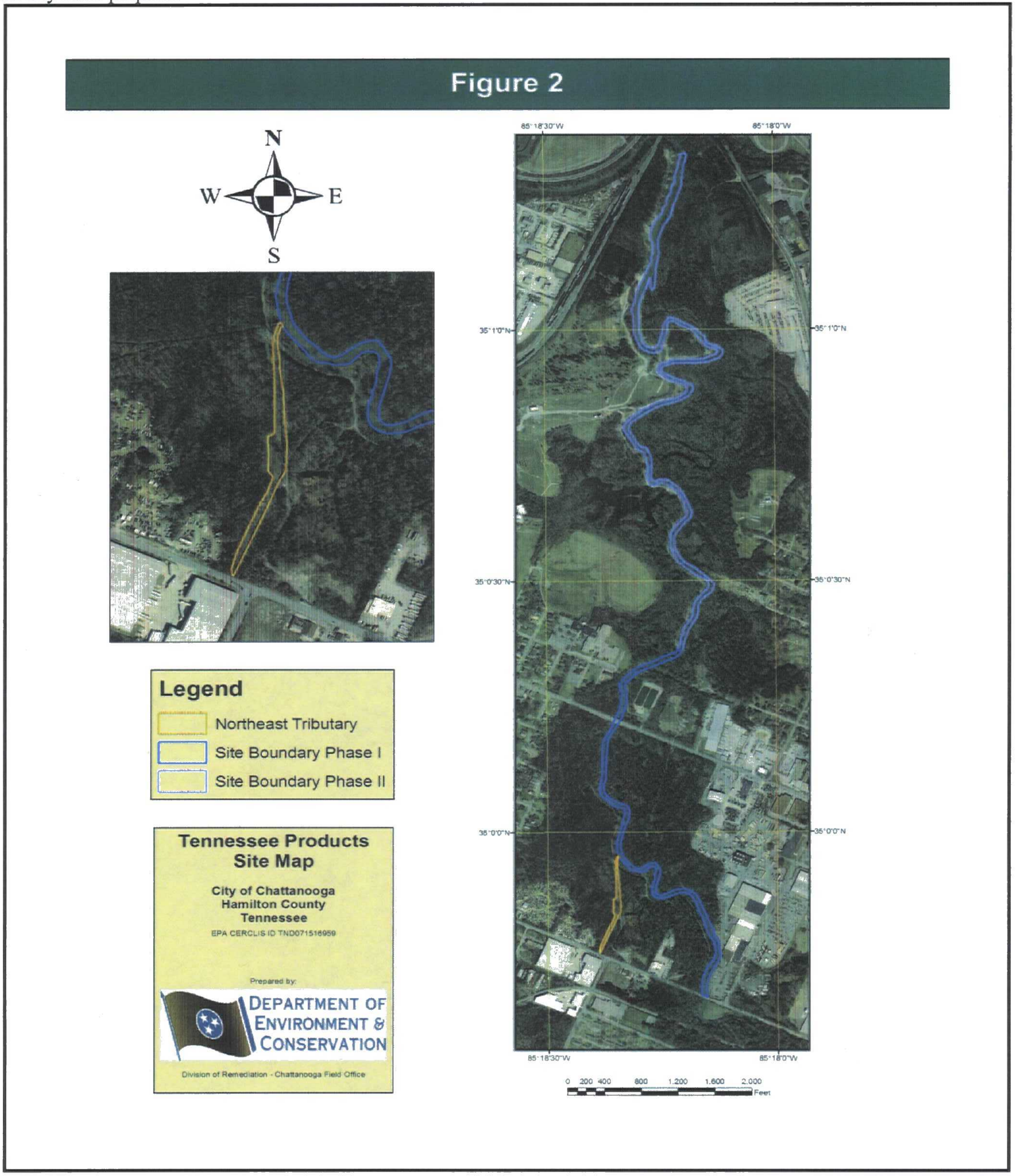


Figure 2: Detailed Map of the Tennessee Products Superfund Site

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding the EPA's response actions at the site, and is not intended for any other purpose."



3.2 Land and Resource Use

Land Use

The Tennessee Products Superfund site is located in a populated area immediately west of downtown Chattanooga, Tennessee. An assessment of current land usage adjacent to the Site was conducted during the Remedial Investigation. The TPS Site is located in the South Side Area Planning District as designated by the Chattanooga-Hamilton County Regional Planning Agency. The boundaries of the South Side Planning District are defined to the north by I-24, to the south by the State line, to the east by Chattanooga Creek, and to the west by Lookout Mountain.

Prior Land Use

According to 1994 data compiled by the Planning Agency, the land use for this area was: (1) 20% residential; (2) 10% industrial; (3) 27% vacant (i.e., either on steep slopes or in the floodplain); (4) 6% commercial; (5) 5% institutional; (6) 9% recreation; and (7) 23% other (i.e., including streets, water, utilities). Interspersed within the industrial facilities are several housing projects and many individual residences.

Current Land Use

Land uses essentially are the same as they were at the time of the Record of Decision (ROD).

Projected Land Use

Projected land use for this area is: (1) 25% residential; (2) 16% industrial; (3) 4% commercial; (4) 2% institutional; (5) 32.5% recreation; and (6) 20% other (i.e., including streets, water, utilities). The Chattanooga-Hamilton County Regional Planning Agency did not project the "Vacant" category percentage, as it is assumed that it will be incorporated into the future Residential, Commercial and Recreational uses.

Ground and Surface Water Uses

Prior Resource Use

At the time of the ROD, private drinking water wells were not known to exist within a 4-mile radius of the Site. Drinking water for the area was supplied by the Tennessee-American Water Company whose intake is on the Tennessee River approximately four (4) miles upstream of the confluence of Chattanooga Creek and the Tennessee River. Groundwater was not generally used for irrigation or livestock watering. The closest active industrial wells (1999) to the Site were Southern Cellulose Products' two wells (both 150 feet deep) on 38th Street, and the Chattanooga Glass Company well (325 feet deep) on West 45th Street. There were no known nearby surface water withdrawals (for drinking water) located downstream of the Site in Chattanooga Creek or the Tennessee River. The closest downstream public water withdrawal intake was located at South Pittsburg, Tennessee, on the Tennessee River, approximately 30 river-miles downstream from the confluence of Chattanooga Creek and the Tennessee River. Chattanooga Creek was used for swimming, playing, and fishing by both children and adults, although warning signs have been posted. Consumption of fish caught from the Creek has been reported, also despite warning signs. In addition, homeless people are reported to sometimes bathe in the Creek and drink Creek water.

Current Resource Use

With exception of the Chattanooga Glass Company well (325 feet deep) on West 45th Street, resource uses are essentially the same as they were at the time of the ROD. The Chattanooga Glass Company is no longer in operation, so it is presumed that the well is no longer in use.

Projected Resource Use

Resource use is not expected to change in the foreseeable future.

Hydrogeology and Hydrology

Groundwater in the region occurs within both the unconsolidated and consolidated materials. The unconsolidated materials include the alluvial deposits and residuum described above. These materials generally have low water yield and are thus not considered an important groundwater source.
The consolidated materials consist of shale, sandstone, limestone, and dolomite that form the bedrock. Water in limestone typically occurs in secondary features such as fractures and bedding planes, particularly those that have been enlarged by solution of calcareous material. These features occur erratically and cause hydraulic conductivities to be extremely variable throughout the region. This property explains why one well may be dry and another nearby well at the same depth into the bedrock produces water. Typically, most of the water encountered in limestone is near the top of the rock where weathering has increased the number of secondary features.

Shales generally have low yields. Sandstones, particularly those on Lookout Mountain, may yield large quantities of water. Limestones and dolomites produce variable amounts of water depending on the number and size of fractures and solution cavities encountered. In general, the most productive aquifers in the region are the formations of the Knox Group.

Groundwater is recharged primarily by the percolation of rainwater through the soils. Generally, groundwater discharges locally to ponds, streams (such as Chattanooga Creek), springs, and by general seepage.

Chattanooga Creek is in the Tennessee River basin, which is regulated by a series of dams along the River and large tributary dams in the headwaters. Chattanooga Creek originates from the slopes of Georgia's Lookout Mountain, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River just downstream of downtown Chattanooga, and above Nickajack Reservoir. Nickajack Lake is the result of the Tennessee Valley Authority (TVA) constructing a hydroelectric dam at River Mile 425. The Creek is a gaining stream throughout its course and in its Georgia headwaters is fed by several springs. Some of the more notable springs feeding it are Powder Mill, Tannery, Crutchfield, and Blowing. The majority of contributing tributaries also enter the Creek's base flow in Georgia, except for Dobbs Branch, which is three miles upstream from the mouth of the Creek. In its entirety, the Chattanooga Creek has a watershed of nearly 75 square miles, of which approximately twenty per cent is in Tennessee. It occupies the northern portion of the Chattanooga Valley between Lookout Mountain and Missionary Ridge.

Average annual streamflow in Chattanooga Creek in Tennessee is on the order of 100 cubic feet per second (cfs). The Creek falls about 1.5 feet per mile and is relatively shallow, usually not over 4 feet deep and in many places much less, on the order of 3 to 4 inches, depending on the time of year. The average depth appears to be 2 to 4 feet, except where artificially deepened. In the extremely shallow areas, a brisk current is evident, but along most of the length of Creek in Tennessee, the current is scarcely discernable. The stream banks appear to average approximately 2 to 4 feet, except where artificially heightened. Occasional flooding occurs, as evidenced by trash entangled in trees and bushes 3 to 4 feet above the normal stream level.

The topography of the surrounding area of Chattanooga Creek is rough and mountainous, promoting a special susceptibility of the stream to overflow due too heavy, short duration, spring and summer storms. Floodplain development is considered to be heavy in the Chattanooga Creek basin. Backwater from severe Tennessee River floods could extend up the entire length of Chattanooga Creek. Headwater flooding prevails along Chattanooga Creek, but has not been a major problem. In the past, as recently as March 2003, Tennessee River backwater has caused heavy flood damage to the highly developed floodplain.

3.3 History of Contamination

3.3.1 Historical Origin of Contamination

3.3.1.1 Coke Plant

The coke production processes at the former Tennessee Products Coke Plant (Coke Plant) over its 82-year history (1913-1995) have led to the environmental problems in nearby areas, including Chattanooga Creek. Briefly, coal carbonization removes gases from coal by heating. This process changes coal to coke, which is used for industrial purposes. The off-gases were used for residential heating and lighting. A typical coke oven produced 80% coke, 12% coke-oven gases, 3% coal tar (containing primarily phenols, naphthalene, and other various PAHs), and 1 % light oils (such as benzene, toluene, and xylene). The only known regulated hazardous waste generated by the coke production process is a decanter tank car sludge (i.e., waste K087) which contains primarily phenol and naphthalene. The waste handling procedures used by the Coke Plant over its 82-year history are uncertain. However, uncontrolled dumping of coal tar wastes off-site was apparently a procedure used at one time as is indicated by the discovery of the Chattanooga Creek Tar Deposit and the Hamill Road Dumps. In December 1993, EPA conducted a search for other coal tar waste deposits along the floodplain of Chattanooga Creek between 38th Street and Hooker Road Bridge, on the west side of the Creek, but no additional sites were found.

Although not a direct waste disposal method, numerous discharges of contaminated surface water to the northeast and northwest tributaries have been documented from 1977 until 1990. These tributaries flow from the Coke Plant and discharge to the Creek 1,800 feet downstream of the Creek's intersection with Hamill Road Bridge. The contaminated surface water contained significant levels of PAHs, phenols, oil, and grease, ammonia, and metals. In addition, the Coke Plant reportedly maintained a private sewer line that discharged wastewaters directly to Chattanooga Creek 1 and 1/8 miles from the plant. This sewer line existed in 1944 and appears on a 1967 diagram of the Plant. The sewer line was constructed and used by both the Chattanooga Coke and Gas Company and the Tennessee Products Corporation, which dates its operation and use to as early as 1926. There is evidence that the sewer line was also used by the Reilly Tar and Chemical Company. Reportedly, the sewer line terminated at the Creek just upstream of the Hamill Road Bridge. Based on the results of geophysical surveying conducted during the Remedial Investigation, the sewer line still exists beneath both the Coke Plant and the Velsicol facility. However, instead of discharging directly into Chattanooga Creek, the sewer line appears to have been rerouted such that it now terminates at the Northeast Tributary, just south of the railroad tracks traversing through the middle of the Landes Company site.

The EPA conducted two aerial photographic studies of an area surrounding the Tennessee Products Site. One analysis was to identify potential locations of coal tar deposits in the vicinity of Chattanooga Creek. The purpose of the other analysis was to document past waste disposal activities and other environmentally significant events on and near the Coke Plant.

Up to 23 aerial photographs spanning a period from 1935 through 1994 were analyzed. The analysis identified suspected disposal areas, impoundments, staining, tanks, debris, coal storage areas, open storage areas, containers and drums, mounded material which may represent waste piles, probable vegetation damage due to surface run-off from the Site areas, and discharges to surface drainage pathways.

In general, the aerial photographs showed the nature of the activities on-site. On the Tennessee Products Site, the old Coke Plant area, the photographs clearly showed coal storage, processing, and loading areas, as well as dark staining on the ground throughout the Coke Plant area.
In addition, several of the aerial photos showed mounded dark materials on both sides of the railroad tracks at the eastern corner of the Coke Plant. Open storage and debris piles were also evident in this general area on several aerial photos. In the 1958 aerial photo, an area to the south and across the railroad tracks from the mounded material is an area which appears as stressed vegetation. The distressed vegetation area is larger in the 1964 aerial photo. An oil/water separator was visible on the 1973 aerial photo and was located on the Coke Plant side of the railroad tracks in the aforementioned area. The installation of the oil/water separator indicated a wastewater discharge. The overflow from this oil/water separator would flow northward in a ditch that follows the railroad track. This ditch leads to the Northeast Tributary via a culvert under the railroad tracks.

The coke production process and the migration off-plant of production products and residues are responsible for a wide variety of contaminants at other Site areas, including the Creek. These contaminants include, but are not limited to, a wide variety of PAHs, including lighter chemicals such as benzene, toluene, ethyl benzene, and xylene (BTEX), and metals.

3.3.1.2 Reilly Tar Facility

The Reilly Tar property had been used to produce coal tar products (i.e., road tar and ruffing pitch and other coal tar pitches) from 1921 to 1976. The tar products were made from the by-products of the adjacent coke production plant. In 1976 Velsicol purchased a parcel of land from Reilly Tar and Chemical.

3.3.1.3 Velsicol Chemical Facility

The original facility at the Velsicol main plant site was constructed in 1948 by the Tennessee Products Corporation to expand toluene chlorination operations from the adjacent coke plant.
Velsicol purchased the facility from the TPC in 1963. At the time of the purchase, the following chemicals were being produced at the plant: benzoyl chloride, benzoic acid, benzyl chloride, benzyl alcohol, benzotrichloride, benzoate esters, benzoguanamine, benzonitrile, benzaldehyde, and sodium benzoate.

3.3.1.4 Southern Wood Piedmont

The Southern Wood Piedmont wood treatment facility operated from 1925 until 1988. It is located adjacent to the Middle Reach of the Chattanooga Creek below the 38th Street Bridge. Up until 1940 wastewater from the facility was discharged directly in the Creek. Later this wastewater was channeled into a wetland adjacent to the Creek and finally into a City sewer line.

3.3.2 Investigations

3.3.2.1 State and Federal Investigations and Enforcement

In 1973 and 1977, EPA conducted a number of studies in the Chattanooga area, including two which focused on Chattanooga Creek. The early studies centered on water quality, and did not address the Creek sediments. The major sources of contamination were identified, and the wastewater discharges, as well as Chattanooga Creek surface water, were characterized. These early studies included analyses of water for organic compounds.

In 1980, the Tennessee Valley Authority (TVA) conducted a special survey for toxic priority pollutants which included sediment samples. The findings indicated that much of the Creek sediment was contaminated. During this period an agreement was reached between EPA and Velsicol Chemical Company to prevent the migration of contaminants from the area known as "Residue Hill." Residue Hill (Hill) is a capped landfill located south of the Site, which contains chemical residues and that were leaking leachate. The Hill was capped and a leachate collection system installed in an attempt to stabilize the Hill.

The discovery of toxic materials in the Creek during the TVA study and the completion of the Velsicol project highlighted the need for further data to adequately characterize the Creek's water quality, contaminant concentrations in the sediment and aquatic biota. In order to address these data gaps, an aquatic life study was conducted by the Tennessee Division of Water Quality Control (TDWQC) during June 1981; EPA, TVA, and TDWQC performed a sediment study of the Creek during 1981 and a water quality study was done by TDWQC in July 1982. Results of these studies showed that the worst contamination in the Creek occurred between Creek mile (cm) 5.06 and cm 2.10. This stretch of the Creek included the Hamill Road Dump # 1 (i.e., HRD1) site which contained a wide variety of organic compounds. Within this reach of the Creek also lies the sewer outfall and tributaries (Northeast and Northwest Tributaries) that for many years served as conduits for Velsicol Chemical, Reilly Tar (Reilly Industries, Inc.), and Coke Plant wastewater discharges into the Creek. A large deposit of PAH-contaminated soil/sediment was detected near Creek mile 4.47 at the confluence of the Creek and the Northeast Tributary. The sewer outfall was just upstream of the Hamill Street Bridge; reportedly, the sewer was in working order from 1944 onward and was abandoned at some unknown time decades later.

The Site was the subject of a June 1981 Discovery under the Superfund pre-remedial program. A Preliminary Assessment (PA) was completed by the TDEC, in January 1983 under the USEPA CERCLA PA/SI Cooperative Agreement with EPA Region 4. This assessment indicated that the Site had significant contamination, further studies were warranted, and the Site was a good candidate for the National Priorities List (NPL). As a result, a high priority Site Inspection was conducted. A Site visit was made on May 8, 1986, and an inspection was performed on May 12, 1986 by the TDEC.

During 1990, a water quality and sediment study was completed by Dynamac Corporation for the EPA on the Creek. Additionally, Resource Conservation and Recovery Act (RCRA) 3007 information request letters were sent to all facilities located along the Creek. Responses to these letters provided some information regarding potential sources of contamination from these industries. Results of the sediment study indicated that the areas previously identified during the 1980s were still contaminated to the same relative degree. The sediment study also concluded that the PAHs were the most abundant compounds detected, and that general water quality above Dobbs Branch (i.e., Upper and Middle Reaches) had slightly improved. The improvement can probably be attributed to elimination of wastewater discharges to the Creek, remediation of Hamill Road Dump # 1 and Hamill Road Dump # 3, partial remediation of the Southern Wood Piedmont site and the installation of an infiltration collection system at the 38th Street Dump. Comparisons of the 1980 and 1990 studies show that contaminant concentrations and stream conditions below Dobbs Branch (i.e., the Lower Reach) had not changed.

In mid-1992, the Science and Ecosystems Support Division (SESD) of the EPA, EPA contractors and TDEC collected sediment samples from the Georgia/Tennessee state line to the Creek's mouth at the Tennessee River. Following data collection, the EPA prepared the *Chattanooga Creek Sediment Profile Study Report*. The field effort was divided into two phases. Phase I consisted of collecting sixty sediment/soil samples, 13 water samples and one waste sample. This initial phase of the study indicated that the lower reaches of the Creek bed, from the Hamill Road Bridge downstream, are naturally underlain with a heavy clay deposit. The sampling also indicated that Creek sediments along the entire length of the Site are contaminated with coal tar derivatives. Less ubiquitous, and often associated with the mound deposits near the Hamill Road Bridge, are other VOCs indicative of chemical manufacturing/ processing. Other contaminants of concern sporadically found on-site are: BTEX compounds (i.e., benzene, toluene, ethylbenzene, and xylenes); pesticides; PCBs (polychlorinated biphenyls); and metals (i.e., chromium, mercury, lead, and barium). Water samples infrequently exhibited contamination and were shown to be nearly as clean as the control sample upstream of the heavily industrialized section of the Creek (i.e., upstream of the Upper Reach).

Phase II of the survey delineated and quantified the Creek sediments contaminated with coal tar derivatives from Hamill Road Bridge to Dobbs Branch. During this field effort, cross-sections were set up at intervals along this reach and core samples were taken down to natural alluvial materials. This enabled the EPA to get a profile of the Creek bed and extrapolate volumes of material which needed to be removed. The estimate derived from these studies predicted that 14,500 cubic yards of material would need to be removed from the streambed.

In 1993, the Agency for Toxic Substances and Disease Registry (ATSDR) issued a Public Health Advisory for Chattanooga Creek. The Health Advisory concluded that the "the presence of the coal tar in and around the creek poses a health and safety hazard." Because of the unrestricted access to a portion of the Creek, people could be exposed to Site-related contaminants through ingestion and dermal contact. The coal tar deposits are also physical hazards to adults and children that wander into these areas. ATSDR's recommendations were: (1) dissociate nearby residents from the coal tar deposits; (2) continue characterization studies of the Site; (3) consider the Site for inclusion on the NPL; (4) use appropriate EPA statutory or regulatory authority to take necessary actions; and, (5) consider other coal tar contaminated sites along the Creek for inclusion on the NPL. Based on this Health Advisory, EPA initiated a non-time-critical removal of the most accessible coal tar deposits along the Upper Reach of the Creek and at the former Southern Coke and Chemical plant site (i.e., the Coke Plant area). In 1996, EPA issued an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action, which was consistent with a planned long-term remedial action strategy. On September 26, 1996, EPA issued an Action Memorandum approving the proposed non-time-critical removal action as described in the EE/CA. After commencing the removal action, the EPA recognized that volume of sediment contaminated with coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and August 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of Creek sediments contaminated with coal tar derivatives.

In June/July of 1997, the U.S. Army Corps of Engineers, working under a cooperative agreement with the EPA, had its primary contractor for the project, IT Corporation, perform a delineation of coal tar deposits in the Creek. The purpose of the delineation was to determine the distribution and quantities of coal tar in the Creek for the upcoming removal action. The delineation occurred along a 5,800 foot section of the Creek, starting at Hamill Road Bridge and ending 1,300 feet downstream of the East 38th Street Bridge, in the vicinity of Alton Park Junior High School.

Earlier, in March/April of 1997, IT Corporation had performed a delineation of coal tar deposits in the Creek starting approximately 1,350 feet downstream of the East 38th Street Bridge to the property line of Southern Wood Piedmont Company. This comprised an approximately 2,600 feet reach of the Creek. On May 18, 1998, IT Corporation completed a delineation of coal tar deposits in the Creek sediments upstream of Hamill Road Bridge. The reach delineated extended from 100 feet upstream of the Hamill Road Bridge to the Hamill Road Bridge itself.

3.3.2.2 PRP Investigations

In December 1995, Mead Corporation, a potentially responsible party, completed a '*Post-Removal Baseline Assessment*' of the Coke Plant area in which both soil and groundwater sampling was conducted. A total of 83 soil (i.e., 40 surface and 43 subsurface), 17 groundwater, and 1 DNAPL (i.e., dense non-aqueous phase liquids) samples were collected and analyzed for Target Compound List (TCL) volatile organic chemicals, and Target Analyte List (TAL) inorganic chemicals (i.e., metals) using EPA Contract Laboratory Program (CLP) protocols. Unfortunately, the results of this investigation were not made available to EPA until the field investigation for the EPA Fund-lead RI was already more than 50 % complete. Thus, there was much duplication of effort between Mead Corporation's field investigation and the EPA RI. However, because the data collected by Mead Corporation appeared to be valid and appropriate for a remedial investigation, this data was incorporated and was discussed in the subsequent sections of the RI along with the data collected by the EPA contractor as part of the planned Fund-lead remedial investigation.

3.4 Initial Response

On September 26, 1996, the EPA issued an Action Memorandum approving the proposed non-time-critical removal action (Phase I removal action) as described in the 1996 EE/CA. After commencing the removal action in June, 1997, EPA recognized that the volume of sediments contaminated by coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and December 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of contaminated sediments in the Creek. The removal Action was completed in December, 1998.

Over the course of the eighteen months of the Phase I removal action, a total of 4,235 linear feet of Chattanooga Creek was excavated, along with three isolated tar pits located in the flood plain and adjacent to the former coke plant. The total material excavated was 25,350 cubic yards, of which 22,934 cubic yards came from the excavation of Chattanooga Creek. Figure 2 depicts the location of the Phase I removal action for Chattanooga Creek.

3.5 Basis for Taking Action

As stated in Section 3.3.2, in 1993, the ATSDR issued a Public Health Advisory for Chattanooga Creek. The Health Advisory concluded that the "the presence of the coal tar in and around the creek poses a health and safety hazard." Characterization of soils and sediments in Chattanooga Creek revealed the presence of numerous contaminants. Risk evaluation of the contaminants estimated the total current excess carcinogenic risk from direct exposure to Site soils to be as high as 2E-04. Sediment was also found to present elevated risk. The Contaminants of Concern (COCs) contributing most to this risk level were benzo(a)pyrene and other PAHs in sediment. This risk level indicates that if no clean-up action was taken, an individual visiting the site could have an increased probability of 2 in 10,000 of developing a detectable cancer within a lifetime as a result of site-related exposure to COCs based upon reasonable maximum exposures (RMEs). It should be noted that risk associated with exposure to non-carcinogenic contaminants was deemed acceptable. Table 2 presents the estimated carcinogenic risk posed by the principal Site COCs through several possible exposure scenarios.

Table 2: Risk Characterization Summary

Table 2
Risk Characterization Summary - Carcinogens (Reasonable Maximum Exposure (RME) Scenario)

Scenario Timeframe: Current
Receptor Population: On-Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Excess Carcinogenic Risk: Ingestion	Inhalation	Dermal	Exposure Route Total
Soil	Soil (and Soil Dust)	Northeast Tributary Area - On-Site Worker Scenario	Alpha-BHC	3E-06	8E-10	2E-06	5E-06
			Arsenic	7E-06	2E-08	1E-06	8E-06
			Benzo(a)anthracene	1E-04	3E-08	8E-05	2E-04
			Benzo(b &/or k) fluoranthene	2E-04	6E-08	2E-04	4E-04
			Benzo(a)pyrene	1E-06	3E-07	1E-03	1E-03
			Carbazole	3E-07	---	3E-07	6E-07
			Chromium	---	1E-07	---	1E-07
			Chrysene	1E-06	3E-10	8E-07	2E-06
			4,4-DDE	8E-07	---	6E-07	1E-06
			Dibenzo(a,h)anthracene	1E-04	3E-08	1E-04	2E-04
			Dieldrin	2E-07	6E-11	1E-07	3E-07
			Indeno(1,2,3-cd)pyrene	6E-05	2E-08	5E-05	1E-04
			Column Total	2E-03	6E-07	1E-03	2E-03
						On-Site Worker Current Excess Carcinogenic Risk Subtotal =	2E-03
						On-Site Worker Current Excess Carcinogenic Risk Total =	2E-03

Table 2
Risk Characterization Summary - Carcinogens (RME Scenario)

Scenario Timeframe : Current

Receptor Population : Site Visitor Receptor Age : Adult							
				Excess Carcinogenic Risk			
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Ingestion**	**Inhalation**	**Dermal**	**Exposure Route Total**
Soil	Soil	Northeast Tributary Area - Site Visitor Scenario	Alpha-BHC	2E-07	3E-11	3E-07	5E-07
			Arsenic	3E-07	7E-10	2E-07	5E-07
			Benzo(a)anthracene	6E-06	4E-09	1E-05	2E-05
			Benzo(b &/or k) fluoranthene	1E-05	2E-09	2E-05	3E-05
			Benzo(a)pyrene	2E-05	1E-08	1E-04	1E-04
			Carbazole	2E-08	---	3E-08	3E-08
			Chrysene	6E-08	8E-10	1E-07	2E-07
			4,4-DDE	5E-08	---	8E-08	1E-07
			Dibenzo(a,h)anthracene	7E-06	9E-10	1E-05	2E-05
			Dieldrin	1E-08	2E-12	2E-06	2E-06
			Indeno(1,2,3-cd)pyrene	4E-06	5E-10	6E-06	1E-05
			Column Totals	1E-04	2E-08	2E-04	2E-04
						Site Visitor Current Excess Carcinogenic Risk Subtotal =	2E-04
						Site Visitor Current Excess Carcinogenic Risk Total =	2E-04

Table 2
Risk Characterization Summary - Carcinogens (RME Scenario)

Scenario Timeframe : Current Receptor Population : Resident Receptor Age : Adult							
				Excess Carcinogenic Risk			
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Ingestion**	**Inhalation**	**Dermal**	**Exposure Route Total**
Sediment	Sediment	Chattanooga Creek - Middle Reach - Resident Scenario (Adult)	Alpha-BHC	5E-06	---	9E-06	1E-05
			Arsenic	2E-07	---	1E-07	3E-07
			Benzene	3E-10	---	3E-10	6E-10
			Benzo(a)anthracene	2E-05	NA	4E-05	6E-05
			Benzo(b &/or k) fluoranthene	3E-05	NA	5E-05	8E-05
			Benzo(a)pyrene	2E-04	NA	3E-04	5E-04
			Beryllium	7E-08	---	3E-08	1E-07
			Carbazole	3E-07	---	5E-07	8E-07
			Carbon Tetrachloride	2E-09	---	2E-09	4E-09
			Chrysene	2E-07	NA	3E-07	5E-07
			4,4-DDT(p,p-DDT)	2E-08	---	3E-08	5E-08
			Dibenzo(a,h)anthracene	1E-05	NA	2E-05	3E-05
			Dieldrin	2E-06	---	3E-06	5E-06
			Gamma-Chlordane	4E-08	---	8E-08	1E-07
Sediment (cont'd)	Sediment (cont'd)	Chattanooga Creek - Middle Reach Resident Scenario (Adult) (cont'd)	Hexachlorobenzene	2E-07	---	4E-07	6E-07
			Indeno(1,2,3-cd)pyrene	1E-05	NA	2E-05	3E-05
			PCB-1248	1E-06	---	2E-06	3E-06
			PCB-1260	4E-07	---	7E-07	1E-06
			2,3,7,8-TCDD TEQ	3E-07	---	6E-07	9E-07
			Column Totals	3E-04	---	5E-04	7E-04
						Resident Current Excess Carcinogenic Risk Subtotal =	7E-04
						Resident Current Excess Carcinogenic Risk Total =	7E-04

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(f)(5)(i) of the NCP. The nine criteria include:

1. Overall Protectiveness of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

The Site, as defined in the September 30, 2002 ROD, is the bed and banks of Chattanooga Creek, and comprises only one OU. Although there are areas of the Chattanooga Creek flood plain that were also addressed under the TPS remedial action, these areas were not broken out into separate OU's, but instead were addressed as part of the same OU and remedy selected for the TPS Site.
The RAO's, as specified in the ROD were:

- Minimize direct contact by the public and workers with soil and sediments containing excessive levels of Chemicals of Concern (COCs).

- Minimize direct contact by the public and workers with surface water containing excessive levels of COCs.

- Minimize direct contact by the public and workers with groundwater containing excessive levels of COCs.

- Minimize transport of contaminated soil and sediment by erosion to water courses, including the Tennessee River.

- Minimize potential for leaching of COCs to groundwater from areas of high concentration.

In order to accomplish the RAO's specified above, a remedy was chosen that consisted of a combination of the following: excavation, stabilization, treatment, recycling, offsite disposal and stream restoration. During the first phase of removal (1997-1998), emphasis was placed on waste to fuel recycling of the excavated and stabilized sediments. Due to changing economic conditions and associated cost constraints, the second phase of remedial work (2005-2007) opted for chemical stabilization and offsite disposal of the excavated sediments in lieu of recycling, as specified in the August 3, 2004 (ESD. In situations where excavation was not practicable, the sediments were covered in place and physically stabilized. There were no Institutional Controls (IC's) specified in the remedy, and there are none in place. The focus of the remedy consisted of removal of contaminants, as presented in the following excerpt from the ROD:

> *A general description of the Selected Remedy is presented in this section. The details of the design for the Selected Remedy will be set forth in the EPA-approved Remedial Design during the Remedial Design and Remedial Action (RD/RA) phases of the Site response. The Selected Remedy focuses on the Middle Reach of Chattanooga Creek and an area of the bank of the Northeast Tributary where old contaminated dredging spoils are mounded.*
>
> - *Chattanooga Creek Sediments -*
>   - *The Middle Reach of the Creek has numerous areas of coal tar-contaminated sediments (i.e., sediment bars) which will be re-identified, excavated, and processed to consolidate coal tar residues which will then be transported to an EPA-approved off-site facility for waste-to-fuel recycling. The remediation of the Middle Reach of the Creek and the bank of the Northeast Tributary (an area of mounded dredging spoils about 10 feet by 100 feet in area) will be conducted in a manner similar to the approach used to conduct the 1997-98 non-time-critical removal of the sediments in the Upper Reach of the Creek in 1997-98. Unlike many contaminants, coal tar derivatives are remarkably visible in sediments. Hence, in the 1997-98 non-time-critical removal, visual determination of the extent of PAH contamination was used. The same technique for identification will be used for the Middle Reach cleanup. However, if certain excavated sediments appear to be uncontaminated, then those sediments shall be subjected to sampling and analyses for the PAHs on the Target Compound List (TCL). The action levels for sediment removal will reflect EPA's excess lifetime carcinogenic risk range of 1×10^{-6} to 1×10^{-4} (See Table G - 9.).*
>
> - *Northeast Tributary Area (mounded dredging spoils) –*
>   - *The previously identified area of mounded dredging spoils (an estimated 444 cubic yards), along the bank of the Northeast Tributary, will be excavated, removed, and consolidated with excavated Creek sediments for off-site waste-to-fuel recycling. The dredging spoils will be excavated using visual identification of the grossly contaminated sediments and soils. Once the spoils piles are removed, confirmatory sampling and analyses of soils for the PAHs on the Target Compound List (TCL) will be undertaken to determine whether additional excavation and removal of soils will occur. The action levels for soil removal upon confirmatory sampling and analysis will reflect EPA's excess lifetime carcinogenic risk range of 1×10^{-6} to 1×10^{-4} (See Table G - 9.). Once all affected soils are removed, the excavated area will be filled with clean fill and seeded to promote the growth of local natural foliage.*

Although not specified directly in the ROD, in situations during the Phase I remedial action where it was not practicable to remove all contaminants (i.e. old meanders and certain portions of creek banks), preventing exposure to any residual contaminants was conducted via Engineering Controls (EC's), which consisted of geotextile fabric, soil and rip rap covers. It should also be noted that the above excerpt does not reflect the modification to disposal specified in the ESD. The ESD allowed disposal of stabilized sediments at a local municipal landfill rather than at a waste-to-fuel facility.

4.2 Remedy Implementation

On September 26, 1996, EPA issued an Action Memorandum approving the proposed non-time-critical removal action (Phase I removal action) as described in the 1996 EE/CA. After commencing the removal action in June, 1997, EPA recognized that the volume of sediments contaminated by coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and December 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of contaminated sediments in the Creek. The removal Action was completed in December, 1988.

Over the course of the 18months of the Phase I removal action, EPA's contractor, IT Corporation, excavated a total of 4,235 linear feet of Chattanooga Creek, along with three isolated tar pits located in the flood plain and adjacent to the former coke plant. The Phase I remedial action began at the Hamill Road Bridge and ended approximately 1,350 feet downstream of the East 38th Street Bridge. The total material excavated was 25,350 cubic yards, of which 22,934 cubic yards came from the excavation of Chattanooga Creek. Figure 2 depicts the location of the Phase I removal action for Chattanooga Creek. In 2003, negotiations began between EPA and PRPs for reimbursement of costs associated with previous removals and for implementation of additional remedial actions. On May 4, 2005, a RD/RA Consent Decree was filed, which included the following PRPs: the United States General Services Administration, MW Custom Papers, LLC (MeadWestvaco Corporation); Reilly Industries, Inc. (now known as Vertellus); and Southern Wood Piedmont Company. The private PRPs formed the Chattanooga Creek Cleanup Committee, LLC (4C) to implement the remedial action selected in the 2002 ROD, as amended by the August 3, 2004 ESD. Other PRPs, including the United States General Services Administration, Velsicol, and NWI, contributed financially, but were not actively involved with the remedial action at the Site.

4C's contractor, Envirocon, mobilized to the site in early September 2005 to begin the Phase II remedial action. Phase II began at1,354 feet north of the 38th Street Bridge, where it was determined Phase I ended, and extended approximately 10,250 feet to the confluence of Chattanooga Creek and Dobbs Branch, an approximate 1.9 mile reach. Remediation of a dredged spoil pile located along the Northeast Tributary was also included in the ROD and incorporated into the Phase II remedial action.
Site preparation activities were completed during September and October 2005. Excavation and stabilization of contaminated sediments began in mid-October, 2005, and was performed until work could no longer continue efficiently due to weather conditions in January 2006. Necessary equipment and personnel were remobilized in mid-April 2006 to continue sediment excavation and stabilization activities and begin restoration activities. Construction activities were performed until December 2006 when the second and final winter shutdown began. This final winter shutdown ended in April 2007. Again, necessary equipment and personnel returned to the Site to complete sediment excavation and stabilization and site restoration activities. During winter shutdowns, heavy equipment was decontaminated and removed from the Site and the drying bed was covered. A limited number of personnel remained on-site to maintain erosion controls, monitor water management systems, provide site security, and perform other required inspection and monitoring activities. Work was completed in September 2007, and all equipment, temporary structures, and temporary utilities were removed.

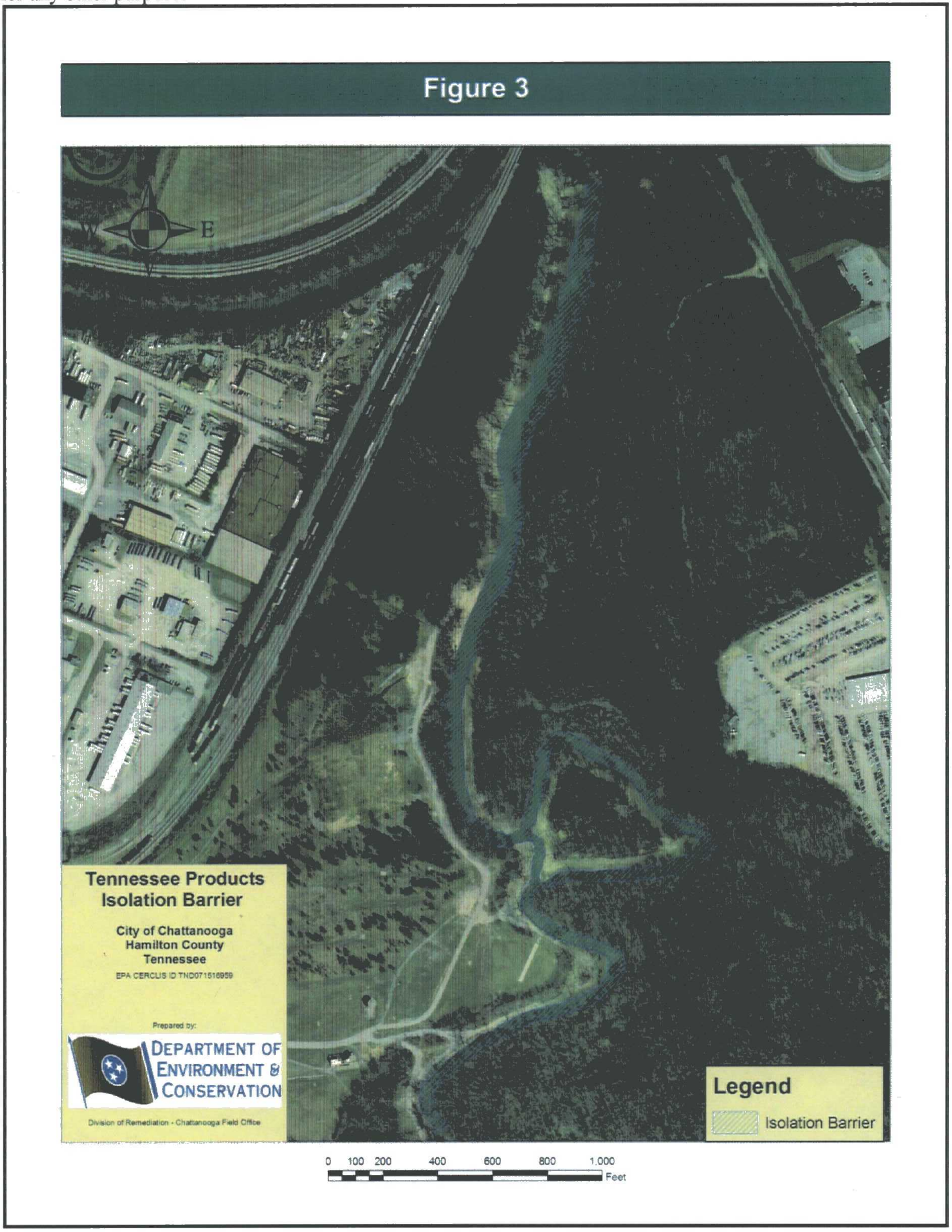
Chattanooga Creek makes an oxbow as it flows onto the property owned by Southern Wood Piedmont Company. During excavation of a portion of the oxbow in January 2006, a black liquid was observed infiltrating the bottom of the excavation. Notifications to the EPA and TDEC were made of this condition. Envirocon placed 12-inches of clay in the first 250-foot section of the oxbow in an attempt to seal off the liquid. The seal did not work. Discussions and investigations by EPA SESD took place during the winter shutdown to determine an appropriate response to address the black liquid, now known to be non-aqueous phase liquid (NAPL). Based upon the EPA SESD NAPL Assessment Report released in June 2006, the EPA modified the scope of work to include installation of a protective isolation barrier to mitigate recontamination concerns.

The design for the isolation barrier included the use of AquaBlok®, which is a patented solid aggregate that is coated with a clay polymer that expands when hydrated. As the AquaBlok® materials hydrate and coalesce, the mass transforms into a cohesive, low permeability barrier. For the isolation barrier, a minimum 12-inch prepared subgrade soil layer was placed over the creek bed and banks to a level that was a minimum of three feet above the highest point of observed NAPL intrusion. The creek banks were graded or maintained at a maximum 2:1 slope. In addition, holes created by previous excavations were filled to create a generally smooth surface, thus creating a longitudinal cross section of the creek that is gently undulating without any abrupt changes in grade.

Ultimately, 5,750 linear feet of isolation barrier was placed in the creek channel, beginning approximately 4,500 feet downstream of the 38th Street Bridge, where the NAPL first became evident along property owned by Southern Wood Piedmont. Placement of the isolation barrier continued uninterrupted, due to the presence of NAPL, until the termination of the Phase II remedial action at the confluence of Dobbs Branch, approximately 10,250 feet downstream of the 38th Street Bridge. Figure 3 depicts the approximate extent of the AquaBlok® isolation barrier.

Figure 3: AquaBlok® Isolation Barrier Location Map

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding the EPA's response actions at the site, and is not intended for any other purpose."



4.3 *Operation and Maintenance (O&M)*

The ROD does not include allowances for O&M, as the assumption at the time the ROD was prepared was that all contamination would be removed. Therefore, there are no O&M requirements or costs under CERCLA associated with the TPS Site at the time of this FYR. However, O&M has been incorporated under RCRA and is further discussed below.

As stated in the above section, the unanticipated occurrence of NAPL along the Southern Wood Piedmont property necessitated the placement of the isolation barrier. As long as NAPL remains present beneath the isolation barrier, periodic inspection of the isolation barrier is warranted to verify its effectiveness in preventing NAPL breakthrough to Chattanooga Creek.

EPA's Office of Research and Development (ORD) laboratory in Cincinnati, OH is involved in contaminated sediments research and was interested in the performance of the AquaBlok® isolation barrier at this site. EPA ORD issued a task order to Tetra Tech in October 2009 that employed solid phase microextraction (SPME) probes to measure pore water trends in the cap layer over time. This task order provided funding and resources to monitor cap performance for three years (2009, 2010 and 2011). The majority of field work and data analysis was subcontracted to Dr. Danny Reible with the Environmental and Water Resources Engineering College at the University of Texas at Austin. Monitoring data generated by this effort indicated the cap was effective in isolating the residual contamination from release to surface water or sediment.

The revised permit for the SWP facility was issued November 17, 2011. The revised permit stipulated quarterly visual inspections of the AquaBlok® cap and annual Laser Induced Fluorescence (LIF) sampling. Arcadis U.S., Inc. conducted visual inspections beginning in March 2012 and LIF sampling began in May 2012. LIF sampling takes place at five locations, beginning immediately upstream of the AquaBlok® cap, and continuing to the downstream extent of the cap (Figure 4). The most recent inspection report available was completed by Arcadis in October 2015. The next annual inspection report is due October 2016. All inspections and sampling events conducted as of the time of this FYR indicate the AquaBlok® cap is functioning as intended.

Long term O&M is necessary due to the presence of DNAPL. Continuation of the RCRA SWP post closure permit monitoring and sampling obligation is necessary to verify the AquaBlok® cap functions as designed.

Figure 4: Sample Location Map*

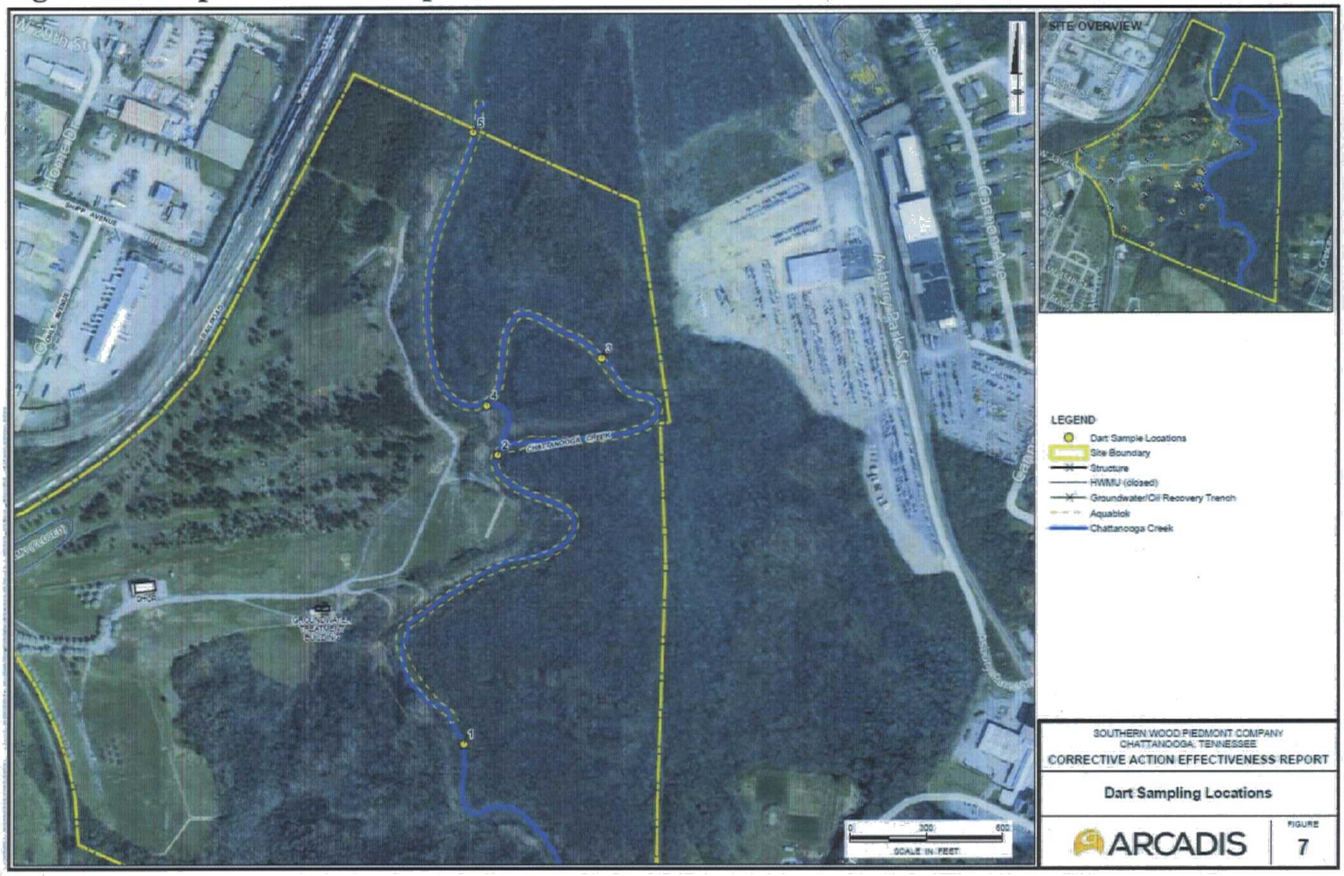


*Figure taken from the Southern Wood Piedmont Arcadis Corrective Action Effectiveness Report No. 15, dated October 2015.

5.0 Progress Since the Last Five-Year Review

Since the first FYR for the TPS Site, the permit for the SWP was revised to include quarterly visual inspections of the AquaBlok® cap and annual LIF sampling. Beginning in March 2012, four years of these monitoring and inspection events have taken place, with the fifth year underway. The inspections indicate the AquaBlok® cap is functioning as intended.

The protectiveness statement from the first FYR is:

The remedy implemented at the Tennessee Products Site currently protects human health and the environment. Two years of SPME monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Porewater concentrations in the upper layers of the cap are very low (e.g. in the parts per trillion range) and do not exceed chronic surface water quality criteria. It is important to note that comparisons of porewater concentrations to surface water quality criteria is very conservative in that substantial dilution would be expected between porewater and surface water. Moreover, there is little change between the 2009 and 2010 PAH concentrations in the cap material suggesting that no significant migration of contaminants is occurring up through the AquaBlok® barrier. However, in order for the remedy to be protective in the long term, there needs to be a mechanism in place to ensure regular inspection and monitoring of the barrier's effectiveness. To that end, EPA has requested that TDEC include the necessary inspection and monitoring requirements to the TDEC RCRA Post-Closure Permit for the SWP facility.

The 2011 FYR included one issue and one recommendation. This report summarizes each recommendation and its current status below.

Issue:
There should be some mechanism in place for continued monitoring and regular inspections to ensure future protectiveness of this remedy.

Recommendation:
Follow up with SWP and TDEC RCRA Program from 06/14/11 and 09/12/11 meetings to verify that inspection and monitoring of the AquaBlok® cap was incorporated into Final RCRA Post Closure Permit for the SWP Facility.

Table 3: Progress on Recommendations from the 2011 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Follow up with SWP and TDEC RCRA Program from 06/14/11 and 09/12/11 meetings to verify that inspection and monitoring of the AquaBlok® cap was incorporated into Final RCRA Post Closure Permit for the SWP Facility.	SWP	09/12/2011	The RCRA SWP Post Closure Permit was modified to include quarterly visual inspections of the AquaBlok® cap and annual LIF sampling.	11/17/2011

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated this FYR in February 2016, and scheduled its completion for September 2016. The EPA TPS Site review team was led by Craig Zeller of EPA, Remedial Project Manager (RPM) for the TPS Site, and also included the EPA site attorney. On February 3, 2016 EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection;
- Interviews; and
- Five-Year Review Report development and review.

6.2 Community Notification

On July 13, 2016 a public notice was published in the *Chattanooga Times-Free Press* announcing the commencement of the Five-Year Review process for the TPS Site, providing Mr. Craig Zeller's contact information, and inviting community participation. The press notice is available in Appendix B.

The Five-Year Review report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated public repository: Tennessee Department of Environmental and Conservation, Chattanooga Field Office, 1301 Riverfront Parkway, Chattanooga, TN. Upon completion of the FYR, a public notice will be placed in the *Chattanooga Times-Free Press* to announce the availability of the final FYR report in the Site document repository.

On September 19, 2016 the DoR attended a community meeting to discuss the TPS Site. The community was aware of the site, but many individuals were unaware of the completed remedial action. DoR summarized the remedial actions and emphasized analytical data and monitoring indicate the TPS Site is not impacted by Site related contamination. The community requested copies of the FYR be provided for two local repositories. Additional concerns were expressed by some community members for portions of Chattanooga Creek located downstream of the TPS Site based on the historical presence of former industrial sites located along the creek that were not addressed by the TPS Site removals.

6.3 Document Review

This FYR included a review of relevant, site-related documents comprised of the four Arcadis LIF reports. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review
Section 121 (d)(2)(A) of CERCLA specifies that Superfund RAs must meet any federal standards, requirements, criteria, or limitations that are determined to be legally ARARs. Applicable or Relevant and Appropriate Requirements are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. To-Be-Considered criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding, but should be considered in

determining the necessary level of cleanup for protection of human health or the environment. While TBCs do not have the status of ARARs, EPA's approach to determining if a RA is protective of human health and the environment involves consideration of TBCs along with ARARs. Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemical-specific ARARs include the Maximum Contaminant Levels (MCLs) specified under the Safe Drinking Water Act (SDWA) as well as the ambient water quality criteria that are enumerated under the Clean Water Act. Because there are usually numerous contaminants of potential concern for any Site, various numerical quantity requirements can be ARARs.

There were no numeric cleanup goals specified for the sediments in Chattanooga Creek. The ROD required that visual determination of the extent of PAH contamination be utilized to determine the limits of excavation at the creek. Confirmation sampling within the limits of the creek channel excavation was not required. Standard construction methods and best professional judgment were used to remove visually contaminated sediments from the creek bed. Where visible contamination extended into the creek bank, a maximum of three feet was to be removed horizontally from the original bank and then sealed off. Field representatives from the PRPs contractor, BWSC, inspected completed stream reaches before notifying EPA that a reach was ready for inspection by EPA to verify achievement of the performance standard.

The final remedy selected for this Site in the ROD was designed to decrease the total excess lifetime carcinogenic risks, based on removal of Reasonable Maximum Exposure (RME) levels of PAHs in soil and sediments, at least two (2) orders of magnitude below the 1×10^{-6} risk level (i.e., down to 1×10^{-8}), which would meet or exceed all chemical-specific ARARs, as well as meet location- and action-specific ARARs. However, as mentioned above, confirmation sampling within the limits of the creek channel excavation was not required. Therefore, there are no chemical-specific ARARs identified in the selected remedy for sediments, surface water or groundwater within the ROD and subsequent ESD. The ROD did stipulate confirmatory sampling for soils associated with the Northeast Tributary. Risk-based chemical-specific ARARs for the Northeast Tributary are listed in Table 3.

Table 4: Remedial Goal Options for Northeast Tributary Dredging Spoils

	Carcinogenic Risk Level (Exposure Frequency = 104 days/year)		
Chemical (TEF)	**For 1E-06** (mg/kg)	**For 1E-05** (mg/kg)	**For 1E-04** (mg/kg)
Benzo[a]pyrene (1.0)	0.6	6	60
Benzo[a]anthracene (0.1)	6	60	600
Benzo[b/k]fluoranthene (0.1)	6	60	600
Chrysene (0.001)	600	6,000	60,000
Dibenz[ah]anthracene (1.0)	0.6	6	60
Indeno[123-cd]pyrene (0.1)	6	60	600
Note: All soil Remedial Goal Options values shown are mg/kg. TEF - Toxicity Equivalence Factor- relates carcinogenic potency of other PAHs to that of Benzo[a]pyrene.			

6.4 Data Review

Soil

The ROD required that confirmation sampling be conducted for the remedial action conducted at the Northeast Tributary. Two composite surface soil samples were collected and analyzed for PAHs to verify that remaining PAH concentrations were below the action level specified in the ROD. The results of the two confirmation samples demonstrated compliance with the action levels specified in the ROD. The ROD required that sampling be performed for excavated overburden within the creek working limits that appeared to be uncontaminated and was to be placed back in the creek. The visibly clean overburden was to be segregated and tested for the PAHs on the Target Compound List (TCL). The action level for sediment removal reflects EPA's excess lifetime carcinogenic risk of 1×10^{-6} to 1×10^{-4}. These carcinogenic risk levels equate to 0.6 mg/kg to 60 mg/kg benzo(a)pyrene, respectively. Uncontaminated sediment (overburden) was segregated and placed back in the creek at only one location during the remedial effort. Clay overburden was removed within the short-circuit portion (bypass) of the oxbow for use in construction of a dam in the oxbow area and for modified restoration within the reach. Prior to use, a representative sample of the clay was collected and analyzed for PAHs on the TCL. The results indicated that concentrations of PAHs in the clay were below the remedial goal and the material was appropriate for use at the project site.

Groundwater

Groundwater sampling was not required by the ROD. Groundwater samples were not collected during the remedial action.

Surface Water

The ROD did not specify performance requirements for water quality during implementation of the remedial action at the TPS Site. However, all reasonable efforts were taken to minimize impacts to the creek. The remedial goal was to not degrade water quality as compared to water quality upstream of the project. Treatment units were operated and water quality monitoring was conducted throughout implementation of the remedial action. As a precautionary measure, oil containment booms were in place downstream of temporary coffer dams and booms were in place throughout the construction phase at the most downstream portion of the site. Daily inspections were conducted of the booms to look for evidence of sheens or other signs that may indicate treatment was not successful. During the initial shutdown in early 2006, daily inspections were also made at the oxbow to look for the presence of a visible sheen from the NAPL encountered prior to shut down.

While a NPDES permit was not required for the discharge from the AquaShield™ treatment units to Chattanooga Creek, discussions were held with the TDEC Division of Water Pollution Control to determine appropriate effluent limits as guidance for discharges from the two treatment units. It was agreed by the project team that analytical results of effluent samples collected from the two units would be compared to typical NPDES effluent limits of 10 milligram per Liter (mg/L) for oil and grease, 200 mg/L for total suspended solids (TSS), and a range of 6.0 to 9.0 standard units (s.u.) for pH. These parameters would be used to evaluate the effectiveness of treatment and minimize the impacts to Chattanooga Creek. It was also agreed to collect three background samples from Chattanooga Creek upstream of the project limits for comparison to treatment unit effluent samples to ensure water quality was not degraded.

A total of 44 effluent samples, not including QC samples, were collected from the treatment unit at the creek. Analytical results for the effluent samples at the creek treatment unit were typically below the NPDES effluent limits. One sample in November 2005 and two samples collected in June 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison. One sample collected in July 2006 had an oil and grease concentration of 11 mg/L, just slightly over the 10 mg/L limit used for comparison.

A total of 29 effluent samples, not including QC samples, were collected from the treatment unit at the drying bed. Analytical results for the effluent samples at the drying bed treatment unit were typically below the NPDES effluent limits. Four samples (collected November 22, 2005, January 20, 2006, January 25, 2006, and February 23, 2006) had a pH of over 9 s.u. The elevated pH in November 2005 is believed to be a result of the limestone fines used during the drying bed construction entering the collection piping. Two samples collected in December 2005 and January 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison.

Sediment/Porewater
The ROD required that visual determination of the extent of PAH contamination be utilized to determine the limits of excavation at the creek. Confirmation sampling within the limits of the creek channel excavation was not required. However, ORD provided funding to collect samples as part of a Sediment Sorption research project, which is a large EPA ORD effort to better understand reactive caps. ORD's goal was to assess the effectiveness of the AquaBlok® (isolation barrier) in minimizing vertical and advective transport, as well as obtain a visual understanding of its resistance to erosion. EPA ORD provided funding and resources for 3 years of S SPME monitoring for AquaBlok® cap effectiveness. Sediment grab samples were also collected. This sampling indicated the cap functioned as intended. The permit for the SWP facility, revised November 17, 2011, stipulated quarterly visual inspections of the AquaBlok® cap and annual LIF sampling. The visual inspections began in March 2012 and LIF sampling began in May 2012. Four LIF sampling events between May 2012 and May 2015 indicate contamination is not migrating through the cap.

6.5 Site Inspection

The TPS Site was inspected by Craig Zeller of EPA and Troy Keith of TDEC on June 23, 2016. The inspection area was comprised of the portion of creek where AquaBlok® layer began (approximately 45+00) and downstream to the oxbow. The remaining portions of the creek were inaccessible due overgrown conditions on land and deadfall blocking the creek.

The primary purpose of the inspections was to attempt visual verification of the integrity of the isolation barrier and stream bank stability. There are currently no IC's emplaced as part of the TPS remedial action, nor were any required by the ROD.

During the inspections, personnel saw no indication of stream bank or isolation barrier instability, which would be manifested in the form of erosion and partial or complete slumps of the creek bank. Fallen trees were observed in a few locations along the bank. Observations were limited to areas above the water surface and the depth that water clarity limited observations, which was approximately one foot below the water surface. The site is well vegetated. There is not a site inspection checklist as there is no infrastructure associated with this remedy to inspect or document. The inspection photo log is attached in Appendix C of this FYR.

6.6 Interviews

Interviews with the EPA RPM, and personnel who routinely inspect the site are presented in Appendix D. Also see Section 6.2.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The past four years of LIF monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface.

7.2 Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Yes. All the exposure assumptions, toxicity data, cleanup levels, and RAOs utilized when the ROD and ESD were issued are still valid.

7.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

Yes. Site inspections conducted in 2009, 2010 and 2016 indicate a potentially significant issue with regard to deadfall (e.g. trees falling into restored creek channel). While extremely difficult to prevent, these dead trees could potentially puncture or breach the AquaBlok® protective isolation barrier. Annual inspections should continue to visually inspect the restored stream channel for any signs of sheens or NAPL migration through the cap.

7.4 Technical Assessment Summary

Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. Therefore, the implemented remedy at the TPS remains protective of both human health and the environment.

8.0 Issues, Recommendations and Follow-up Actions

Table 5: Issues and Recommendations Identified in the Five-Year Review

There are no issues or recommendations.

9.0 Protectiveness Statements

Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. All inspections and sampling events conducted as of the time of this FYR indicate the AquaBlok® cap is functioning as intended. Therefore, the remedy at the Tennessee Products Site remains protective of human health and the environment, both in the short term and long term.

10.0 Next Review

The next FYR for the Tennessee Products Site will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

Date	Document
5/1999	Final Report, Removal Action for the Tennessee Products Superfund Site
9/30/2002	Tennessee Products Superfund Site Record of Decision
11/2007	Final remedial Action Report, Tennessee Products Superfund Site
9/2008	Superfund Final Close Out Report, Tennessee Products NPL Site
9/2012	Arcadis Corrective Action Effectiveness Report No. 12, Southern Wood Piedmont
9/2013	Arcadis Corrective Action Effectiveness Report No. 13, Southern Wood Piedmont
9/2014	Arcadis Corrective Action Effectiveness Report No. 14, Southern Wood Piedmont
9/2015	Arcadis Corrective Action Effectiveness Report No. 15, Southern Wood Piedmont

Appendix B: Press Notices

2895134
US EPA
A AJANAKU

STATE OF TENNESSEE
HAMILTON COUNTY

Before me personally appeared Jim Stevens who being duly sworn, that he is the Legal Sales Representative of the CHATTANOOGA TIMES FREE PRESS and that the Legal Ad of which the attached is a true copy, has been published in the above Newspaper and on the website on the following dates, to-wit:

July 13 2016

And that there is due or has been paid the CHATTANOOGA TIMES FREE PRESS for publication the sum of $253.37 Dollars. (Includes $10.00 Affidavit Charge).

Jim Stevens

Sworn to and subscribed before me, this 13th day of July 2016.

Amanda Crawford

My Commission Expires 10/17/2018

AMANDA CRAWFORD
STATE OF TENNESSEE NOTARY PUBLIC
HAMILTON COUNTY
MY COMMISSION EXPIRES OCTOBER 17, 2018

Chattanooga Times Free Press

LEGAL NOTICE

U. S. Environmental Protection Agency, Region 4 Announces the Second Five Year Review For the Tennessee Products Superfund Site, Chattanooga, Hamilton County, Tennessee

The U.S. Environmental Protection Agency (EPA) is conducting the Second Five Year Review of the remedy for the removal of contaminated sediments in Chattanooga Creek from the Workman Road Bridge (formerly Hamill Road) to Dobbs Branch, a tributary near I-24 in south Chattanooga. This Five-Year Review is associated with the Tennessee Products Superfund Site (the Site) located near the Alton Park/Piney Woods neighborhood in south Chattanooga, Hamilton County, Tennessee.

Sediments in Chattanooga Creek became contaminated with coal tar constituents and was caused, in part, by a former coke plant, a tar and chemical company, and a wood treater located near the area. Cleanup work in Chattanooga Creek was conducted in two phases. Phase 1 addressed contaminated sediments from Workman Road Bridge to the 38th Street Bridge, and Phase 2 addressed contaminated sediments from the 38th Street Bridge to Dobbs Branch. In general, both phases of cleanup work involved sediment excavation, off-site disposal, and creek channel restoration. In May 2005, EPA finalized a legal settlement (Consent Decree) with parties potentially responsible for the coal tar and creosote contamination. These parties were collectively known as the Chattanooga Creek Cleanup Committee (4C). Phase 2 cleanup work was completed in September 2007 under the terms of the Consent Decree.

EPA invites community participation in the Five-Year Review process.

The EPA is beginning the Second Five-Year Review to ensure that the remedy at the Site remains protective of human health and the environment. As part of the Five-Year Review process, EPA will be available to answer any questions about the Site. Community members who have questions about the Site, the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

Mr. Craig Zeller
Remedial Project Manager
U.S. EPA, Region 4
61 Forsyth St. (11th Floor)
Atlanta, GA 30303
Phone: 404-562-8827
Zeller.Craig@epa.gov

The EPA plans to complete the Second Five-Year Review report by September 2016. A copy of the final report, and other Site related documents can be reviewed at the Tennessee Department of Environment and Conservation (TDEC) Chattanooga Field Office at 1301 Riverfront Parkway. Please contact Mr. Troy Keith at 423-634-5755 or via email at Troy.Keith@tn.gov for arrangements.

Appendix C
Five-Year Review Site Inspection Checklist

Five-Year Review Site Inspection Checklist

Purpose of the Checklist

The site inspection checklist provides a useful method for collecting important information during the site inspection portion of the five-year review. The checklist serves as a reminder of what information should to be gathered and provides the means of checking off information obtained and reviewed, or information not available or applicable. The checklist is divided into sections as follows:

I. Site Information
II. Interviews
III. On-site Documents & Records Verified
IV. O&M Costs
V. Access and Institutional Controls
VI. General Site Conditions
VII. Landfill Covers
VIII. Vertical Barrier Walls
IX. Groundwater/Surface Water Remedies
X. Other Remedies
XI. Overall Observations

Some data and information identified in the checklist may or may not be available at the site depending on how the site is managed. Sampling results, costs, and maintenance reports may be kept on site or may be kept in the offices of the contractor or at State offices. In cases where the information is not kept at the site, the item should not be checked as "not applicable," but rather it should be obtained from the office or agency where it is maintained. If this is known in advance, it may be possible to obtain the information before the site inspection.

This checklist was developed by EPA and the U.S. Army Corps of Engineers (USACE). It focuses on the two most common types of remedies that are subject to five-year reviews: landfill covers, and groundwater pump and treat remedies. Sections of the checklist are also provided for some other remedies. The sections on general site conditions would be applicable to a wider variety of remedies. The checklist should be modified to suit your needs when inspecting other types of remedies, as appropriate.

The checklist may be completed and attached to the Five-Year Review report to document site status. Please note that the checklist is not meant to be completely definitive or restrictive; additional information may be supplemented if the reviewer deems necessary. Also note that actual site conditions should be documented with photographs whenever possible.

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Tennessee Products	**Date of inspection: 06/23/2016**
Location and Region: Chattanooga, TN, Region 4	**EPA ID: TND071516959**
Agency, office, or company leading the five-year review: TDEC-DoR	**Weather/temperature: Clear/ 90's**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other Sub-aqueous cap. This inspection form is not generally compatible with the remedy. Additional information is attached.

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Davis (Name) — Project Manager (Title) — 09/6/2016 (Date)
   Interviewed ☐ at site ☐ at office ☒ by email Phone no. ______
   Problems, suggestions; ☒ Report attached See Appendix D for interview form.

2. **O&M staff** ______ (Name) ______ (Title) ______ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ______________________
Contact ______________________ ______________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________________

Agency ______________________
Contact ______________________ ______________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________________

Agency ______________________
Contact ______________________ ______________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________________

Agency ______________________
Contact ______________________ ______________ ______ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______________________________________

4. **Other interviews** (optional) ☒ Report attached.

EPA RPM, Craig Zeller.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1. **O&M Documents**				
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
4. **Permits and Service Agreements**				
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
9. **Discharge Compliance Records**				
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☒ PRP in-house ☒ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other ______________________________

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate__________________ ☐ Breakdown attached

Total annual cost by year for review period if available

From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ ______________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: ______________________________

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks______________________________

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks______________________________

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ______________________

Frequency ______________________

Responsible party/agency ______________________

Contact ______________ ______________ ______ ______

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

____

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks______________________

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident

Remarks______________________

2. **Land use changes on site** ☐ N/A

Remarks______________________

3. **Land use changes off site** ☐ N/A

Remarks______________________

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A

Remarks______________________

B. Other Site Conditions

Remarks ____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent ____________ Depth ____________
   Remarks ____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths ____________ Widths ____________ Depths ____________
   Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent ____________ Depth ____________
   Remarks ____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent ____________ Depth ____________
   Remarks ____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent ____________ Height ____________
   Remarks ____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent ____________
   ☐ Ponding ☐ Location shown on site map Areal extent ____________
   ☐ Seeps ☐ Location shown on site map Areal extent ____________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent ____________
   Remarks ____

9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability Areal extent______________ Remarks____ ____
B. Benches	☐ Applicable ☐ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
1.	**Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks____ ____
2.	**Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks____ ____
3.	**Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks____ ____
C. Letdown Channels	☐ Applicable ☐ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
1.	**Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent______________ Depth____________ Remarks____ ____
2.	**Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type______________ Areal extent_____________ Remarks____ ____
3.	**Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent______________ Depth____________ Remarks____ ____

4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent______________ Depth____________ Remarks____	
5.	**Obstructions** Type____________________ ☐ No obstructions ☐ Location shown on site map Areal extent______________ Size____________ Remarks____	
6.	**Excessive Vegetative Growth** Type____________________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent______________ Remarks____	
D. Cover Penetrations ☐ Applicable ☒ N/A		
1.	**Gas Vents** ☐ Active☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____	
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____	
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____	
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____	
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____	

E. Gas Collection and Treatment ☐ Applicable ☒ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks________________________________
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks________________________________
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks________________________________
F. Cover Drainage Layer ☐ Applicable ☒ N/A	
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks________________________________
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks________________________________
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A	
1.	**Siltation** Areal extent______________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks________________________________
2.	**Erosion** Areal extent______________ Depth____________ ☐ Erosion not evident Remarks________________________________
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks________________________________
4.	**Dam** ☐ Functioning ☐ N/A Remarks________________________________

H. Retaining Walls		☐ Applicable	☒ N/A
1.	**Deformations** Horizontal displacement____________ Vertical displacement_______________ Rotational displacement____________ Remarks________________________________	☐ Location shown on site map	☐ Deformation not evident
2.	**Degradation** Remarks________________________________	☐ Location shown on site map	☐ Degradation not evident
I. Perimeter Ditches/Off-Site Discharge		☐ Applicable	☒ N/A
1.	**Siltation** Areal extent______________ Depth____________ Remarks________________________________	☐ Location shown on site map	☐ Siltation not evident
2.	**Vegetative Growth** ☐ Vegetation does not impede flow Areal extent______________ Type____________ Remarks________________________________	☐ Location shown on site map	☐ N/A
3.	**Erosion** Areal extent______________ Depth____________ Remarks________________________________	☐ Location shown on site map	☐ Erosion not evident
4.	**Discharge Structure** Remarks________________________________	☐ Functioning	☐ N/A
VIII. VERTICAL BARRIER WALLS		☐ Applicable	☒ N/A
1.	**Settlement** Areal extent______________ Depth____________ Remarks________________________________	☐ Location shown on site map	☐ Settlement not evident
2.	**Performance Monitoring** Type of monitoring________________________ ☐ Performance not monitored Frequency______________________________ ☐ Evidence of breaching Head differential________________________ Remarks________________________________		

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A The remedy is a sub-aqueous cap	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☒ N/A Remarks
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	**Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

C. Treatment System ☐ Applicable ☒ N/A	
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters________________________ ☐ Additive (*e.g.*, chelation agent, flocculent)________________________ ☐ Others________________________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually________________ ☐ Quantity of surface water treated annually________________ Remarks________________________
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☒ N/A ☐ Good condition ☐ Needs Maintenance Remarks________________________
3.	**Tanks, Vaults, Storage Vessels** ☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks________________________
4.	**Discharge Structure and Appurtenances** ☒ N/A ☐ Good condition ☐ Needs Maintenance Remarks________________________
5.	**Treatment Building(s)** ☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks________________________
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks________________________
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☐ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The remedy is functioning as designed. The sub-aqueous cap appears to be in good condition and monitoring data indicate contamination is effectively contained.
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Site Visit Trip Report

On 6/23/2016 T. Keith (DoR), C. Zeller (EPA) and R. Sewell (MEI) conducted a site visit to observe conditions related to the condition of the sub-aqueous cap in Chattanooga Creek adjacent to the Southern Wood Piedmont site. The inspection was limited to portions of the creek that were accessible and visible by foot. This area consisted of the portion of channel where the cap began (Station 45+00) to the oxbow (Station 60+00). No slumps were observed. In areas where the water depth and clarity allowed for observation of the channel bed, the cap appeared to be in good condition. Numerous trees are down in, and across, the creek channel.

Photo 1: Facing downstream near Station 45+00.


Photo 2: Facing downstream near Station 50+00.

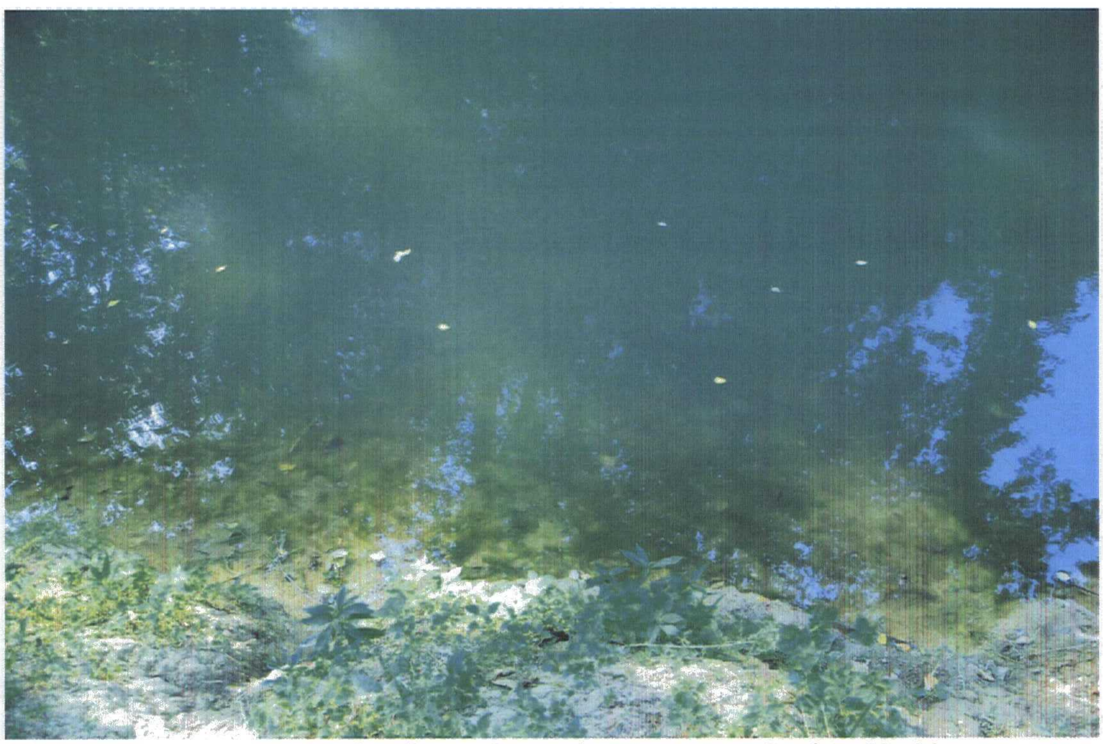


Photo 3: View of sediment layer above cap near Station 50+00.

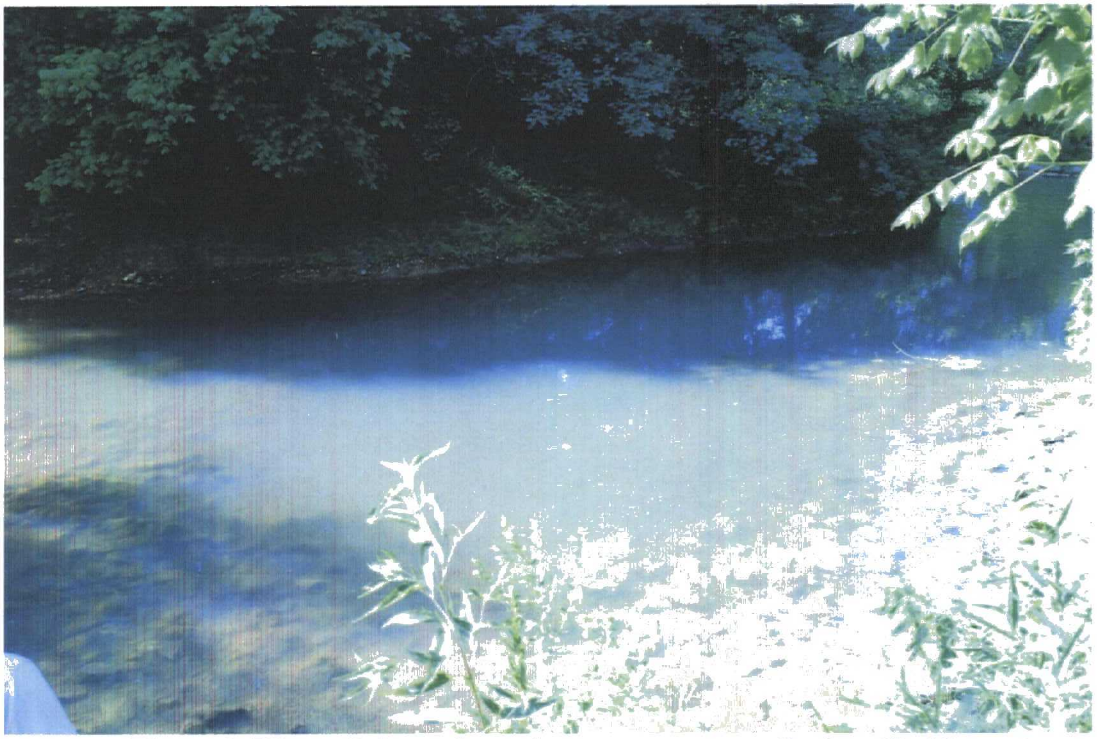


Photo 4: View of channel at oxbow entrance near Station 60+00.

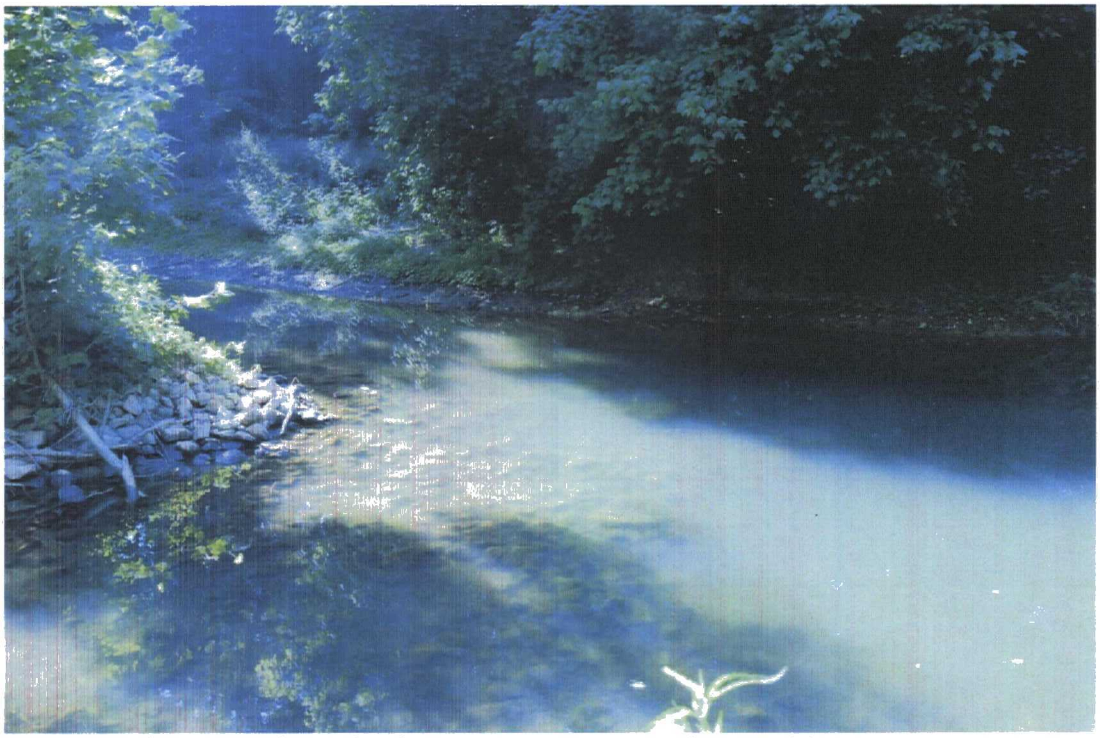


Photo 5: View of oxbow entrance near Station 60+00.

Photo 6: View of oxbow short-circuit, facing downstream, near Station 60+00.

Appendix D: Interviews

Interview Form for Five-Year Review

Site Name: TN Products
Interviewer's Name: Troy Keith **Affiliation:** TDEC
Interviewee's Name: Craig Zeller, Project Manager **Affiliation:** EPA Region 4 (Superfund)
Contact Information: U.S. EPA Region 4
61 Forsyth Street
Atlanta, GA 30303
Zeller.craig@Epa.gov
404-562-8827

Type of Interview: Email
Date: September 6, 2016

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

I remain very satisfied with the success of the cleanup of Chattanooga Creek. Annual monitoring conducted Arcadis, on behalf Southern Wood Piedmont, under the TDEC RCRA program is sufficient to monitor long-term integrity of AquaBlok cap. Re-use activity is hard to gauge considering the site is a creek.

2. What is your assessment of the current performance of the remedy in place at the Site?

Monitoring of the AquaBlok protective cover conducted by Arcadis indicates it remains protective and continues to protect against potential re-contamination.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

No, I am not.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

Nothing substantive at this time.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

No, I am not.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

IC's are not a component of the remedy at this site.

7. Are you aware of any changes in projected land use(s) at the Site?

None.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

None. I would not hesitate to employ AquaBlok at other projects should the situation warrant.

Site Name: TN Products
Interviewer's Name: Troy Keith **Affiliation:** TDEC
Interviewee's Name: Andrew Davis, Project Manager **Affiliation:** Arcadis
Contact Information: Arcadis
30 Patewood Drive, Suite 155
Greenville, SC 29615
864.987.3917

Type of Interview: Email
Date: September 6, 2016

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

Overall, the remedy implemented remains protective of both human health and the environment. The ongoing monitoring program provides adequate data to gauge the continued effectiveness of the remedy.

2. What is your assessment of the current performance of the remedy in place at the Site?

The remedy in place continues to remain protective, as originally intended. The ongoing monitoring program, via both visual inspections and laboratory testing, verifies the performance of the remedy.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

No complaints have been received by Arcadis.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

In 2011, Institutional Controls formerly associated with the Chattanooga Creek were added into the SWP Chattanooga Facility HSWA Permit as part of a Permit Modification. Since the addition, monitoring of the aquablok has been periodically performed. Currently, the Creek is inspected on a quarterly basis with an annual collection of DART samples which are submitted for LIF analysis.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

Yes, institutional controls are performing as intended

7. Are you aware of any changes in projected land use(s) at the Site?

Currently, there are no future projected land uses changes associated with the site. Any potential alternatives would be evaluated prior to implementation.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

None at this time.

SUPERFUND FINAL CLOSE OUT REPORT
Tennessee Products NPL Site
Chattanooga, Hamilton County, Tennessee

February 2019

United States
Environmental Protection
Agency

Prepared By:

Craig Zeller, P.E.
Remedial Project Manager
Superfund Division

3/4/19

Franklin E. Hill, Director Date
Superfund Division
U.S. EPA, Region 4

TABLE OF CONTENTS

LIST OF ACRONYMS

ATSDR	Agency for Toxic Substances & Disease Registry
BWSC	Barge, Waggoner, Sumner & Cannon
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
EE/CA	Engineering Evaluation/Cost Analysis
ESD	Explanation of Significant Difference
EPA	Environmental Protection Agency
FCOR	Final Close Out Report
FS	Feasibility Study
HDPE	High Density Polyethylene
LKD	Lime Kiln Dust
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation & Maintenance
PAH	Poly Aromatic Hydrocarbon
PID	Photoionization Detector
PPM	Parts Per Million
PRP	Potentially Responsible Party
PVC	Poly Vinyl Chloride
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RCRA	Resource Conservation & Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
STEL	Short Term Exposure Limit
SWP	Southern Wood Piedmont
SWPPP	Storm Water Pollution Prevention Plan
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment & Conservation
TSS	Total Suspended Solid
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Final Close-Out Report (FCOR) documents, as a supplement to the initial Final Close Out Report (September 2008), that the Region 4 Office of the United States Environmental Protection Agency (EPA) has completed all construction activities for the Tennessee Products Superfund (TPS) site in Chattanooga, TN in accordance with the Final Record of Decision (as modified), the Final Remedial Design and Drawings, and EPA's Close Out Procedures for National Priorities List Sites (EPA OSWER Directive 9320.2-22; May 2011). EPA and the Tennessee Department of Environment and Conservation (TDEC) conducted a Pre-Final Inspection at the site on August 23, 2007, and a Final Inspection on September 13, 2007. Based on these inspections and review of the Final Remedial Action Report, EPA and TDEC have concluded that the Chattanooga Creek Cleanup Committee (4C) has constructed the remedy in accordance with the Record of Decision (ROD as modified), the Remedial Design/Remedial Action (RD/RA) Consent Decree and the approved Remedial Design (RD) plans and specifications.

All cleanup activities have been successfully implemented, all cleanup goals/ performance standards have been achieved, and the remedy is considered protective of human health and the environment. No further remedial action construction activities are anticipated at this site. The RD/RA Consent Decree does not require future monitoring or any operation and maintenance activities. As discussed in Section 8.0 below, Five Year Reviews are being conducted to ensure the remedy remains protective over the long-term.

2.0 SUMMARY OF SITE CONDITIONS

2.1 Site Background and Enforcement History

Chattanooga Creek originates from the slopes of Lookout Mountain in Georgia, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River upstream of Nickajack Reservoir. The creek is a gaining stream throughout its course. The majority of tributaries enter the creek in Georgia with the exception of Dobbs Branch, which enters Chattanooga Creek three miles upstream of the mouth of the creek. The general project location is illustrated on Figure 1.

The TPS Site includes an approximate 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex and adjacent industrial facilities in an urban industrial and residential area of south Chattanooga were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of Chattanooga Creek sediments. Numerous discharges of contaminated water to Chattanooga Creek via tributaries were documented. Results of previous investigations and subsequent evaluations indicated that existing conditions posed a potential unacceptable risk to human health if exposure to the contaminated sediments were to occur.

The TPS Site was proposed for inclusion on the National Priorities List (NPL) in January 1994 after completion of a multi-media investigation of Chattanooga Creek by the EPA and the issuance of a Health Advisory by the Agency for Toxic Substances and Disease Registry (ATSDR) in 1993. The TPS Site was placed on the NPL September 29, 1995. The EPA CERCLIS ID Number for this Site is TND071516959.

An EPA-lead Remedial Investigation and Feasibility Study (RI/FS) was initiated in 1994 and completed in 1999. During May 1996, an Engineering Evaluation and Cost Analysis (EE/CA) was completed for the non-time-critical removal of coal tar-contaminated sediments from a portion of Chattanooga Creek. EPA performed two removal actions: 1) removal of a coal tar mound located near the coke plant complex in 1997; and 2) removal of contaminated sediments from the Upper Reach of Chattanooga Creek and waste piles in 1998. The Upper Reach of Chattanooga Creek stretches from the Hamill Road Bridge to north of the 38th Street Bridge. The removal of contaminated sediments from this portion of the creek was given high priority because this reach of the creek was the most accessible by the local community.

In September 2002, EPA Region 4 issued the Final ROD for the TPS site. The ROD selected the remedial action for the Middle Reach of Chattanooga Creek and a portion of the Northeast Tributary. The Middle Reach includes the bed and banks of Chattanooga Creek beginning 1,354 feet north of the 38th Street Bridge and extending to the confluence of Chattanooga Creek and Dobbs Branch, an approximate 1.9 mile reach. Remediation of a dredged spoil pile located along the Northeast Tributary was also included in the ROD. EPA issued an Explanation of Significant Difference (ESD) to the ROD in August 2004. The ESD allowed disposal of stabilized sediments at a local municipal landfill rather than at a waste-to-fuel facility.

The primary objective of the ROD was to eliminate or reduce potential risks to human health and the environment from the exposure to contaminated sediments within the Middle Reach of Chattanooga Creek and along the Northeast Tributary area. The scope of work required by the ROD and subsequent ESD involved the following general tasks:

- Excavate, by dredging or standard excavation, visually contaminated sediments and soils in the bed and up to three feet into the banks of the creek and at the Northeast Tributary spoil pile;
- Consolidate and stabilize contaminated sediment at an on-site or nearby location;
- Perform TCLP, paint filter, and other analytical tests on waste samples as may be required by the landfill operator(s) to confirm that wastes meet applicable RCRA landfill requirements;
- Transport consolidated contaminants to an approved off-site landfill;

- Stabilize creek banks, where necessary, to minimize erosion and prevent contamination that is buried in the creek bank from re-entering the creek; and
- Restore disturbed portions of the construction zone adjacent to the creek bed to a condition that facilitates redevelopment.

In 2003, negotiations began between EPA and Potentially Responsible Parties (PRPs) for reimbursement of costs associated with previous removals and for implementation of additional remedial actions. A RD/RA Consent Decree, filed on May 4, 2005, included the following PRPs: MW Custom Papers, LLC (MeadWestvaco Corporation); Reilly Industries, Inc. (now known as Vertellus); and Southern Wood Piedmont Company. The PRP Group formed the Chattanooga Creek Cleanup Committee, LLC (4C) to implement the remedial action selected in the 2002 ROD, as amended by the ESD. Other PRPs, including the United States General Services Administration, Velsicol, and NWI, contributed financially, but were not actively involved with the removal actions at the site.

2.2 Implementation of Remedial Action

The remedial action was divided into the following components to meet all Performance Standards as defined in the RD/RA Consent Decree, including the standards set forth in the ROD and as modified by the ESD.

2.2.1 Project Management

EPA Region 4 was the lead regulatory agency for construction oversight during implementation of the RD/RA activities. Craig Zeller was the designated Remedial Project Manager for EPA. The Tennessee Department of Environment and Conservation (TDEC) was a support agency for the regulatory response. Troy Keith in the Division of Remediation, Chattanooga Field Office, was the primary point of contact for TDEC. TDEC representatives were authorized by EPA to perform daily inspections and verify achievement of performance standards for the excavation of contaminated sediment and restoration activities.

4C appointed John Jones of Vertellus (formerly Reilly Industries, Inc.) as Project Coordinator and Sandra Watson of Southern Wood Piedmont Company as Alternate Project Coordinator. 4C retained Envirocon, Inc. as their Supervising Contractor. John Jones of 4C was the day-to-day liaison between 4C and Envirocon. Larry Johnston of Envirocon was the Remedial Action Coordinator and representative on-site during implementation of the removal action. Barge, Waggoner, Sumner and Cannon (BWSC) was a sub-consultant to Envirocon and was involved in remedial design and construction quality assurance/quality control (QA/QC).
Doye Cox was the BWSC Project Manager and Carrie Stokes the Project Quality Control Coordinator. Analytical Industrial Research Laboratories, Inc. provided all analytical services during implementation of the project.

4C contracted with Ackermann Public Relations Company to assist with community relations during the planning and implementation of the remedial action. A construction kick-off public meeting was held on September 20, 2005, to discuss the approach for the project and allow for discussion of any public concerns. Two additional public meetings were held over the course of the remedial action. On October 17, 2006, EPA and 4C sponsored a public meeting to provide an update on the first year of construction work. The final public meeting was on held October 25, 2007 to provide an overall summary of the completed remedial action. Media Days were also held at the site in 2005 and 2006 for members of local television stations and local newspapers to document construction progress and to interview EPA, TDEC and spokespersons for 4C.

Monthly progress reports were provided to EPA by 4C to communicate the following: actions completed; results of sampling; deliverables completed; progress of construction; actions planned for the next month; schedule issues; and community relations activities completed.

2.2.2 General Approach for Remedial Action Implementation

The remedial action was implemented by dividing the designated work area into five segments, or creek channel reaches. Prior to the start of construction, markers were established at 250-foot intervals. These markers were used for reference during construction and quality assurance activities. In general, excavation of contaminated sediment and restoration activities occurred starting at the upstream segment and working downstream. The remedial action area within Chattanooga Creek is illustrated on Figure 2.

Envirocon mobilized to the site in early September 2005. Site preparation activities were completed during September and October 2005. Excavation and stabilization of contaminated sediments was performed until work could no longer continue efficiently due to weather conditions. The first winter shutdown of the project began in January 2006 and ended in April 2006. Necessary equipment and personnel were remobilized in mid-April 2006 to continue sediment excavation and stabilization activities and begin restoration activities. Construction activities were performed until December 2006 when the second and final winter shutdown began. This final winter shutdown ended in April 2007. Again, necessary equipment and personnel returned to the site to complete sediment excavation and stabilization and site restoration activities. During winter shutdowns, heavy equipment was decontaminated and removed from the site and the drying bed was covered. A limited number of personnel remained onsite to maintain erosion controls, monitor water management systems, provide site security, and perform other required inspection and monitoring activities. Work was completed in September 2007, and all equipment, temporary structures, and temporary utilities were removed.

Work activities were limited to the creek area, haul roads, drying bed, staging areas, and office area. The hours of operation at the project site were 24 hours a day, seven days a week due to the continuous pumping required to support the dewatering system. The typical operating hours for active excavation and sediment handling at the project site were from 7:00 am to 5:30 pm from

Monday through Friday. Night shift support was provided as necessary to accommodate pumping and security operations. Work was performed on weekends to maintain schedule, as necessary.

Security was provided throughout the project. Access to the western portion of the site was limited by an existing chain-link fence, dense woods, the creek itself, and railroad lines. Access to the eastern portion of the site was limited due to dense woods and swamp lands. A sign was installed near the entrance road directing visitors to sign in at the office area upon arrival at the site. A visitor log was maintained at the Envirocon project office.

2.2.3 Permits, Access Agreements and Authorization to Proceed

Approval by the TDEC Division of Solid Waste Management was required for disposal of special waste (contaminated sediment mixed with lime kiln dust) at the Bradley County, TN landfill. The required waste evaluation application and associated fee were submitted to TDEC in July 2005. Disposal of the special waste from the TPS Site was approved on October 10, 2005. Recertifications for the 2006 and 2007 construction seasons were submitted and approved as well.

Site access agreements were completed in August 2005 with all affected property owners before any site preparation activities begin. Agreements were reached with the following parties:

- Southern Wood Piedmont;
- City of Chattanooga;
- Edwin & Bonnie Duckett;
- Ernest & Eva Pate;
- Robert Poole;
- Sara Hoover;
- Matthew Swoopes; and
- Warren Partners.

A pre-construction project meeting was held on September 20, 2005, with personnel from EPA, TDEC, 4C, Envirocon and BWSC in attendance. A path forward was established to complete remaining Issue for Construction documents. On October 12, 2005, EPA provided authorization to proceed with full scale remediation.

2.2.4 Site Preparation

Envirocon mobilized to the site on September 6, 2005, to begin site preparation activities. EPA allowed Envirocon to begin initial site preparation activities prior to approval of the final design and Notice to Proceed. Site preparation included those activities that were required to be completed prior to initiation of sediment excavation, such as construction of haul roads and the drying bed and establishment of office and staging areas. Three trailers were brought to the site: one trailer served as an office; a second trailer served as a break room for workers; and the third trailer housed small equipment, tools, and supplies.

Silt fencing was installed parallel to the creek and haul roads to provide sediment and erosion control. By the end of October 2005, erosion controls were installed, and the majority of the clearing and grubbing activities and construction of haul roads were complete. Initially, site preparation activities were completed to support construction activities that were scheduled to take place in the 2005 construction season. Those haul roads along the stream reaches that would not be excavated until 2006 were not constructed; however, haul roads were constructed as necessary to access the drying bed. The remaining haul roads for the project were constructed at the start of the second construction season.

2.2.5 Dewatering the Creek Channel

The remedial design strategy for removal of sediments in the Chattanooga Creek work area involved excavation in the dry. The creek dewatering process included installation of temporary coffer dams and pumping systems to route creek water downstream of the active reaches of excavation. These systems were also designed to keep the stream reach just downstream of the active reach dewatered so work could immediately begin in the next reach after completion of the preceding reach. The pumping systems were maintained 24 hours per day, seven days per week to keep the reaches dewatered so work could proceed efficiently. Contact between creek water and contaminated sediments in an active reach of excavation was minimized.

To construct the temporary coffer dams, contaminated sediments were excavated from the construction footprint until the area was visually clean. LKD was mixed with the adjacent sediment to prevent "flow back" into the footprint of the coffer dam. Water was continuously pumped from the area. The dams were constructed of clay or clean fill. Riprap of 6-inch to 12-inch crushed limestone was placed as necessary for erosion control during flooding events. Bags filled with gravel were placed at the dams when necessary to prevent leakage. Construction of dam #1 also included placement of an impermeable barrier of 19-mil HDPE liner, which was "toed in" with the dam, on the upstream side of the dam.

Typically, three coffer dams were in place at one time. Two pump sets, placed just upstream of the first coffer dam, collected water from main stream flow to discharge downstream of the third coffer dam area. Each pump set originally included two 12-inch and two 6-inch centrifugal trash pumps. Heavy rains in November 2005 caused the creek to overflow the dams. The inability of the initial pumping system to control water prompted Envirocon to make a change so that each pump set included two 16-inch pumps. In addition, other pumps were available onsite if increased pumping capacity was required.

In 2005, installation of the 18-inch HPDE discharge line and pumping system was contracted to Godwin. Godwin employees fused the HDPE pipe on-site, arranged the manifold and discharge system, and performed monthly preventative maintenance activities. In 2006 and 2007, the pumps were rented from Rain For Rent and Envirocon fused the discharge line and arranged the pumping system. Rain For Rent employees performed the monthly preventative maintenance activities on the rented pumps. A screen was placed on the pump suction pipes to minimize intake of unwanted debris and animals. During the dewatering process, turtles and fish were relocated upstream to clean areas when encountered.

Even though the pumping and bypass systems were designed to handle the range of flow observed during implementation of the previous removal action in the Upper Reach of Chattanooga Creek, and the pumping capacity was increased during the initial months of remedial activities, flooding occurred periodically due to significant rain events and operation of the Nickajack Dam on the Tennessee River and the Chickamauga Dam, located upstream of the site.

Maintenance pumps were installed in the reach sumps located upstream of each coffer dam to remove local inflow and groundwater. Additionally, temporary ditches were placed throughout the creek footprint to help manage incoming flow. The maintenance pumps discharged the water downstream of reaches being actively dewatered. Water within the active stream reach that came in contact with excavated sediment was pumped and treated prior to downstream discharge as described below in the section titled "Water Management and Treatment".

The pumping system was set up in September 2005 and operation began in October 2005. Dams 1, 2, and 3 were installed in October 2005 to facilitate the work. The pumping system was removed in January 2006 for the winter shutdown. Beginning in March 2006 and completed in April 2006, Dams 1 and 2 were re-established and the pump and piping system reinstalled upstream of Dam 1. The pumping system was relocated several times during the construction season to facilitate work in downstream reaches. The pumping system was again removed in November 2006 in anticipation of winter shutdown in December. The pumping and piping system was re-installed in April 2007 for the last construction season and removed in September 2007.

2.2.6 Excavation of Contaminated Creek Sediments and Spoil Piles at NE Tributary

Contaminated sediment from the creek channel was excavated until the remaining sediments were visually clean. Excavation activities began in October 2005 in Reach 1. On November 2, 2005, a meeting was held on-site with members of EPA, TDEC, 4C, Envirocon, and BWSC. During the meeting, it was agreed upon by all parties that the lateral extent of the creek bank was defined as the vegetative line at the edge of the creek, and that since limestone bedrock was not always present to define the vertical extent, then Envirocon was to remove all visual signs of contamination and excavate test pits, as required, to confirm that no other visual contamination existed. Where visible contamination extended into the creek bank, a maximum of three feet was to be removed horizontally from the original bank. The bank was then to be backfilled with clean fill and stabilized. When these efforts were completed, EPA, or their designated representative, would inspect and approve an excavated reach before restoration activities were completed and water was re-introduced to that portion of the creek.

Excavation of the contaminated creek sediments was conducted in a manner to minimize handling and to contain the contaminated sediment within the creek before direct transfer to trucks for transport to the drying bed for stabilization. Typically, two excavators were in the creek reach working to transport sediment to a common area for load out. A utility loader was available to haul LKD to the sediment staging area in the creek to be used to stabilize sediment that contained significant free liquids prior to loading into the truck. When conditions in the creek allowed, a dozer was used to form a windrow of LKD and mix into the sediment. The mixture was allowed to cure for a period of time that was sufficient to promote drying before the sediment was loaded in trucks. These activities were performed as necessary to reduce spillage during loading of the trucks.

An excavator staged along the creek bank at the load out area was used to load the trucks staged on the haul roads. The trucks were visually inspected prior to leaving the excavation location and prior to leaving the drying bed for reloading. Dry decontamination measures were utilized as necessary for the trucks. Haul roads were inspected daily for spills and any spillage was removed and taken to the drying bed for disposal at the landfill along with the stabilized sediment.
The months during which excavation was conducted in each stream reach are provided below.

- Stream Reach 1 - October 2005 to November 2005;
- Stream Reach 2 - November 2005 to June 2006 (with break between December 2005 and April 2006);
- Stream Reach 3 - June 2006 to July 2006;
- Stream Reach 4 - July 2006 to June 2007 (a portion of the oxbow was excavated in January 2006); and
- Stream Reach 5 - June 2007 to August 2007

Because heavy rains prevented work from being performed in the main creek channel, work was initiated in the oxbow area in December 2005. Continued heavy rains in January 2006 prevented work from being conducted in both the main channel and in the majority of the oxbow.

During excavation of a portion of the oxbow in January 2006, a black liquid was observed infiltrating the bottom of the excavation. Notifications to EPA and TDEC were made of this condition. This section of the creek is on property owned by Southern Wood Piedmont which treated railroad cross-ties with creosote from 1924 to 1988. This mobile NAPL resembled creosote that differed in physical characteristics than the coal-tar impacted sediments that were encountered in the upper reaches of the creek channel remediation. Envirocon placed 12-inches of clay in the first 250-foot section of the oxbow in an attempt to seal off the liquid. The seal did not work. Discussions took place during the winter shutdown to determine an appropriate response to address the non-aqueous phase liquid (NAPL). EPA performed a field investigation within and adjacent to the creek to evaluate the horizontal and vertical extent of the NAPL, source and transport pathways of the NAPL, determine whether the NAPL created a potential for recontamination, and evaluate risks to Human health and the environment posed by the NAPL. Based upon the EPA NAPL Assessment Report released in June 2006, EPA modified the scope of work to include installation of a protective isolation barrier to mitigate recontamination concerns. The modifications were necessary to achieve the Performance Standards and maintain the effectiveness of the remedy. The modified scope of work for the area impacted by the black liquid NAPL included placement of a minimum of 12-inches of prepared subgrade soil layer over the excavated creek bed and banks, placement of a 6-inch layer of AquaBlok blended barrier material, and then placement of a minimum of 6-inches of soil cover. The protective isolation barrier was placed along approximately 5,750 linear feet of restored creek channel and verified as achieving the performance standards. Maintenance and monitoring activities associated with the AquaBlok barrier are the responsibility of the Southern Wood Piedmont facility under the Resource Conservation and Recovery Act (RCRA) through the Final RCRA Post-Closure Permit for the SWP facility that is delegated to the TDEC.

During excavation in Reach 3 in both June and July 2006, additional NAPL was encountered. TDEC directed that additional sampling and analysis was required prior to disposal of sediments from this reach. Contaminated sediments from Station 45+00 to Station 58+50 were stockpiled on the creek bank and stabilized. They were not taken directly to the drying bed. Analytical results from the stockpiles indicated that the stabilized material in the stockpiles passed TCLP and was not hazardous. This material was then transported to the landfill for disposal.

As NAPL continued to enter the creek during excavation activities, the work approach was modified to more efficiently address the remaining stream reach. On September 12, 2006, EPA made a site visit and a path forward was agreed upon by the project team for excavation of the remainder of the creek. Because the area from Station 45+00 to Station 80+00 flooded before modified restoration activities were completed, future excavations were performed in 250-foot sections. Exploratory tests pits were excavated within the reach to identify if coal tar was present and needed to be removed. Decisions concerning removal were made in the field based on the competency of the clay cover above the coal tar seam and the depositional dynamics of the creek reach.

When several exploratory tests pits were excavated within Reach 5 in the days following the September 12, 2006, site visit, several instances of NAPL were observed. While additional test pits were developed to delineate the extent of the NAPL, excavation and removal was suspended for the remainder of 2006 because EPA and TDEC were concerned about leaving large sections of excavated creek channel open when the rains and associated flooding would come in the next few months. A meeting was held on-site on September 19, 2006, between representatives of EPA, TDEC, 4C, Envirocon, and BWSC, to discuss the plan and schedule for additional excavation and installation of the isolation barrier. A path forward for completing restoration of reaches worked within 2006 was agreed upon and implemented. The same methods for sediment excavation and restoration were applied for the remainder of the Middle Reach in 2007 until the project was complete. During excavation activities, turtles and fish were relocated upstream to clean areas when encountered.

Because debris was in contact with, and typically covered in, contaminated sediment, only tires were segregated during excavation. Tires removed from the creek were pressure washed and staged in a designated area on the drying bed. A total of 15.01 tons of tires were sent to a recycler, Mac's Tire Recyclers, in Nashville, TN.

Clearing and grubbing of the Northeast Tributary area was completed in October 2005. The dredged spoils along the Northeast Tributary were removed until visually clean during November 2005. The total area of contamination was estimated to be 1,000 square feet. The spoils were loaded onto trucks and transported to the Bradley County landfill for disposal. Sampling was conducted to confirm that excavation was complete before restoration activities were performed. Once it was verified that the performance standard was achieved, the area was backfilled as necessary and graded to match existing ground. The disturbed area was seeded and mulched. Restoration of the Northeast Tributary area was completed in April 2006.

A total of 107,292.49 tons of contaminated sediment and debris were removed from the creek and the Northeast Tributary area during completion of the project.

2.2.7 Water Management and Treatment

Creek water was managed to minimize direct contact with contaminated sediments during excavation. Berms were constructed as excavation proceeded in a reach to segregate completed areas from the active work areas and from those areas not yet disturbed. For water where direct contact could not be prevented or where sheens were evident, this water was collected by the maintenance pumps in the active reach of excavation and routed to a proprietary oil water separator to remove contaminants. The AquaShield® treatment unit included physical separation in the first stage of the unit and a filter bed for absorption in the second stage. After NAPL was encountered in Reach 3 in June 2006, a front-end weir tank was added prior to the AquaShield® unit at the creek to remove the NAPL and keep it from entering the AquaShield® unit. The AquaShield® unit was moved along the creek as needed within the active reach of excavation.

While the AquaShield® unit was designed to accommodate the flow put through the system, a set of oil containment booms and an absorbent boom were placed 100-feet downstream of the first and third coffer dams and a set placed at the most downstream limits of the site, near the confluence with Dobbs Branch. These containment measures were inspected twice daily for evidence of sheens or other signs that may indicate treatment was not successful.

In August 2006, due to operator error, the contact water within the excavation reach did not receive treatment. A stipulated penalty was issued by EPA for violating the site-specific Remedial Action Work Plan. To prevent recurrence, a dam was installed and the water treatment system (weir tank and AquaShield® unit) moved to a location that would allow capture of all water pumped from upstream during the impacted sediment removal process.

Leachate and decontamination water from the drying bed was collected via float- activated sump pumps and stored in a poly tank onsite. This water was routed through an AquaShield® treatment unit staged at the drying bed for treatment and discharge to the creek. When excavation work was being performed within stream reaches near the drying bed, leachate from the drying bed was pumped to the AquaShield® unit at the creek so only one unit was operational. An AquaShield® unit was not staged at the drying bed during the 2007 construction season. Maintenance on the AquaShield® units was performed by the vendor throughout project completion.

2.2.8 Sediment Stabilization and Transport

Contaminated sediments were stabilized at the drying bed on-site prior to transport to the Bradley County, TN landfill for final disposal. Construction of the drying bed began in September 2005 and was completed in October 2005. The area was cleared and graded to accommodate the desired slopes and proof rolled. Clay was brought in as a base layer for the drying bed. The drying bed was constructed in layers for protection of the existing ground surface in accordance with the final design drawings. A 60-mil HDPE liner was placed on the proof rolled surface followed by a geosynthetic clay liner, drainage layer, 6-inches of sand, 6-inches of #57 stone, 6-oz woven geotextile, and topped with another 6-inches of #57 stone.

Curbs were installed to prevent water from leaving the drying bed area and sumps constructed to collect the water. The drying bed was sloped to promote drainage to the sumps, where water was collected and pumped for treatment. A decontamination pad was also constructed in October 2005 on the load-out side of the drying bed to remove sediments from the truck exteriors before they left the site for transport to the landfill. A field representative visually inspected the trucks and performed decontamination if necessary. Basic decontamination procedures involved dry brush removal of sediment from exterior and tires. When conditions were such that wet decontamination was required, a pressure washer was used.

The excavated sediment was placed on the drying bed from the designated load-in side. Equipment dedicated to the drying bed work area was used to move the sediment across the area of the drying bed, mix with LKD, and handle the sediment. As sediments were removed from the load-out side for transport to the landfill, the sediments from the load-in side were pushed across the length of the drying bed toward the load-out side. When sediments were not being added to the drying bed, or during significant rain events, the drying bed was covered to reduce introduction of additional water.

LKD, stored at one end of the drying bed, was mixed at a rate of approximately 8 % to 10% on a weight basis, or as necessary to pass the paint filter test, to stabilize the material and further promote drying. The LKD source utilized for sediment stabilization was sampled and analyzed prior to use to verify that contaminants of concern were not added to the sediment. The LKD was brought to the site in dump trailers and the pile covered with a tarp when not being incorporated into the sediment.

Periodic sampling was conducted to confirm that the stabilized sediment passed the paint filter test and was a non-hazardous waste suitable for disposal at the Subtitle D landfill. Depending upon the stream conditions and the amount of liquid present, significantly higher quantities of LKD were sometimes required for stabilization. After stabilization with higher LKD quantities, there were no free liquids and, thus, paint filter testing was not performed. This was the case for all work completed in 2007.

Prior to loading of stabilized sediments into the trucks, a PVC bed liner was placed into each truck with the aid of an articulated manlift. The lined trucks, with seals around the tailgate, were loaded with the stabilized sediment from the load-out side of the drying bed for disposal. Hours of operation for the Bradley County landfill are Monday through Friday 6:30 am to 4:30 pm. Trucks were loaded no earlier than 7:00 am in accordance with the City noise ordinance and the last truck loaded for transport to the landfill no later than 3:00 pm. Site exit and transport routes were designed to minimize traffic through neighborhoods.

The first load of stabilized sediment was transported to the Bradley County landfill on October 21, 2005. During the first construction season, a total of 19,343.64 tons of stabilized sediment was shipped to the Bradley County Landfill. After the second construction season, a total of 61,605.22 tons of stabilized sediment had been shipped to the landfill. A final total of 107,292.49 tons of contaminated sediment and debris was transported to the landfill for disposal over the course of the project in a total of 4,338 truckloads. The last load of stabilized sediment was transported from the site to the landfill on September 4, 2007.

The number of loads to the landfill varied daily depending upon operations at the site. The maximum number of loads transported in one day was 76 loads. A truck log was maintained to document loads leaving the site for disposal and was keyed to load number and truck number.

Two spills of stabilized sediment on the roadways occurred during July 2007. In both incidents, the cause of the spill was the result of the tailgate not being properly secured. The first spill occurred on July 2 on Alton Park Boulevard. Approximately two and a half tons of material was spilled. The spilled material was loaded onto another Envirocon contracted truck headed toward the landfill and the spill cleaned up within approximately forty-five minutes. The second spill occurred on July 17 on Interstate 75. Approximately one cubic yard was spilled onto the roadway. The area was contained by the trucking company response team and the Tennessee Department of Transportation within ten minutes. All stabilized sediment was collected and hauled to the landfill. Cleanup was performed to the satisfaction of government agencies in both instances.

2.2.9 Creek Bank Stabilization and Restoration

A combination of placing riprap and seeding was performed for creek bank stabilization. Restoration was consistent with the previous removal action at the Upper Reach of Chattanooga Creek. Areas of the creek bank where excavation of the bank had occurred or potential eroding locations (specifically on outer radius of curves) were stabilized by one of two methods. The first method included placement of a 6-oz non-woven geotextile covered by 6-inch riprap. The riprap was obtained from the temporary coffer dams or imported as required. Other locations requiring stabilization were seeded for a more natural restoration, as feasible.

Restoration of each stream reach was completed in the following months:

- Stream Reach 1 - May 2006;
- Stream Reach 2 - June 2006;
- Stream Reach 3 - June 2006;
- Stream Reach 4 - June 2007; and
- Stream Reach 5 - August 2007

2.2.10 Site Restoration

All coffer dams and stream crossings within Chattanooga Creek were removed at the conclusion of the remedial action. The common fill and sediment was spread out into the creek bed for substrate. The drying bed, staging areas, and haul roads were removed in a manner consistent with the property owner's requests. All disturbed areas, including haul roads removed, were seeded and mulched. The seed mix placed in the drying bed and office areas matched the current grass in place as specified by the property owner. In remaining locations, which are largely along the creek banks, a seed mix of 60% shade tolerant fescue, 30% annual rye, and 10% white clover was placed.

2.2.11 As-Built Documentation

The final placement of haul roads, stream crossings, drying bed, office area, and air monitoring locations are shown on Sheet C1.01 through Sheet C1.04 of the Final Remedial Action Report. Those haul roads that were requested by the property owner to remain after demobilization are indicated on the drawings. Also shown on Sheet Cl.01 through Sheet Cl.04 are areas where riprap was required for stabilization of creek banks.

Cross-sections of the creek were required every 1,000-feet after excavation was complete and prior to introduction of water. These required cross-sections were obtained by a BWSC survey crew for the first approximately 3,250 feet of the Middle Reach of Chattanooga Creek.
Each cross section included five points - 1) top of right bank, 2) midpoint between right bank and centerline, 3) centerline, 4) midpoint between left bank and centerline, and 5) top of left bank.

Installation of the isolation barrier began at Station 45+00 and more frequent and detailed cross sections were required. Within the modified restoration channel reaches, a seven-point cross section was obtained of the prepared subgrade at each 250-foot marker and at one representative location between the markers. These cross-sections were required to verify creek bank slopes were 3:1 maximum.

3.0 DEMONSTRATION OF CLEANUP ACTIVITY QA/QC

Specific Performance Standards were established in the ROD and RD/RA Consent Decree for contaminated creek sediments, uncontaminated creek sediments (overburden), and the Northeast Tributary area. Performance Standards for installation of the protective isolation barrier were established later in the project as described above and in the Modified Statement of Work. On behalf of 4C and Envirocon, BWSC provided day-to-day oversight of compliance with construction QA/QC requirements specified in the Project Quality Management Plan which included the Construction Quality Assurance Plan and the Performance Standards Verification Plan. The following discussion provides a summary of the Performance Standards and construction QA/QC program. The Final Remedial Action Report provides the complete set of construction QA/QC data and a more detailed description of the QA/QC program.

3.1 Excavation of Creek Sediments

The ROD required that visual determination of the extent of PAH contamination be utilized to determine the limits of excavation at the creek. Confirmation sampling within the limits of the creek channel excavation was not required. Standard construction methods and best professional judgment were used to remove visually contaminated sediments from the creek bed. Where visible contamination extended into the creek bank, a maximum of three feet was to be removed horizontally from the original bank and then sealed off. BWSC field representatives inspected completed stream reaches before EPA was notified that a reach was ready for inspection to determine verification of achievement of the performance standard.

3.2 Uncontaminated Creek Sediments (Overburden)

The ROD required that sampling be performed for excavated overburden within the creek working limits that appeared to be uncontaminated and was to be placed back in the creek. The visibly clean overburden was to be segregated and tested for the PAHs on the Target Compound List (TCL). The action level for sediment removal reflects EPA' s excess lifetime carcinogenic risk of 1 x 10-6 to 1 x 104. These carcinogenic risk levels equate to 0.6 mg/kg to 60 mg/kg benzo(a)pyrene, respectively.

Uncontaminated sediment (overburden) was segregated and placed back in the creek at only one location during the remedial effort. Clay overburden was removed within the short- circuit portion (bypass) of the oxbow for use in construction of a dam in the oxbow area and for modified restoration within the reach. Prior to use, a representative sample of the clay was collected and analyzed for PAHs on the TCL. The results indicated that concentrations of PAHs in the clay were below the remedial goal and the material was appropriate for use at the project site.

3.3 Northeast Tributary

The spoil piles along the Northeast Tributary were excavated using visual identification as observed by agency oversight. The ROD required that confirmation sampling be conducted and analysis for PAHs on the TCL be performed to verify that remaining PAH concentrations were below the action level specified in the ROD. Two composite surface soil samples were collected to confirm excavation was complete. The composite samples were collected in the same manner as the preliminary samples collected prior to excavation. The BWSC Project Quality Control Coordinator reviewed the analytical results of the confirmation samples before results were provided to the Envirocon Project Manager as verification that excavation was complete. The results of the two confirmation samples demonstrated compliance with the action levels specified in the ROD.

3.4 Landfill Disposal of Stabilized Sediments

In accordance with the ROD, and as amended by the ESD, the contaminated stabilized sediment was transported to an EPA approved off-site Subtitle D landfill for final disposal. The operators of the Bradley County, TN landfill required analytical testing of the stabilized sediment to confirm the waste met applicable RCRA landfill requirements. Testing was also conducted to ensure all Federal and State requirements concerning transportation were met. Samples representative of the stabilized sediment were collected and analyzed for the paint filter test and TCLP metals, pesticides, SVOCs, and VOCs. A composite sample was collected consisting of five aliquots with each aliquot collected from a 60-foot long section of the 300-foot long drying bed. A grab sample was collected from one of the 60-foot sections for the VOC analysis. Analytical methods utilized by the laboratory allowed comparison with the hazardous waste criteria to confirm the stabilized sediment was non-hazardous. A sample was collected, and results received confirming the material met the disposal criteria prior to any shipments to the landfill.

Representative samples were collected throughout implementation of the remedial activities to ensure the waste characteristics were consistent. Composite and grab samples were collected as described above and submitted for the same analytical suite. Samples were collected twice a week for the first two weeks of operation and then once a week for the remainder of the project. A total of thirty-five stabilized sediment samples, not including QC samples, were collected during implementation of the project. The analytical results for the stabilized sediment samples consistently confirmed that the stabilized sediment met the landfill disposal criteria.

3.5 Water Quality

The ROD did not specify performance requirements for water quality during implementation of the remedial action at the TPS Site. However, all reasonable efforts were taken to minimize impacts to the creek. The remedial goal was to not degrade water quality as compared to water quality upstream of the project. Treatment units were operated, and water quality monitoring was conducted throughout implementation of the remedial action. As a precautionary measure, oil containment booms were in place downstream of temporary coffer dams and booms were in place throughout the construction phase at the most downstream portion of the site. Daily inspections were conducted of the booms to look for evidence of sheens or other signs that may indicate treatment was not successful. During the initial shutdown in early 2006, daily inspections were also made at the oxbow to look for the presence of a visible sheen from the NAPL encountered prior to shut-down.

While a NPDES permit was not required for the discharge from the AquaShield™ treatment units to Chattanooga Creek, discussions were held with the TDEC Division of Water Pollution Control to determine appropriate effluent limits as guidance for discharges from the two treatment units. It was agreed by the project team that analytical results of effluent samples collected from the two units would be compared to typical NPDES effluent limits of 10 milligram per Liter (mg/L) for oil and grease, 200 mg/L for total suspended solids (TSS), and a range of 6.0 to 9.0 standard units for pH. These parameters would be used to evaluate the effectiveness of treatment and minimize the impacts to Chattanooga Creek. It was also agreed to collect three background samples from Chattanooga Creek upstream of the project limits for comparison to treatment unit effluent samples to ensure water quality was not degraded.

A total of forty -four effluent samples, not including QC samples, were collected from the treatment unit at the creek. Analytical results for the effluent samples at the creek treatment unit were typically below the NPDES effluent limits. One sample in November 2005 and two samples collected in June 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison. One sample collected in July 2006 had an oil and grease concentration of 11 mg/L, just slightly over the 10 mg/L limit used for comparison.

A total of twenty-nine effluent samples, not including QC samples, were collected from the treatment unit at the drying bed. Analytical results for the effluent samples at the drying bed treatment unit were typically below the NPDES effluent limits. Four samples (collected November 22, 2005, January 20, 2006, January 25, 2006, and February 23, 2006) had a pH of over 9 s.u. The elevated pH in November 2005 is believed to be a result of the limestone fines used during the drying bed construction entering the collection piping. Two samples collected in December 2005 and January 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison.

3.6 Storm Water

An NPDES Storm Water Construction Permit was not required, but TDEC requested that a site-specific Storm Water Pollution Prevention Plan (SWPPP) be developed. Inspections were conducted twice weekly and after rain events in accordance with the SWPPP throughout completion of the remedial action. Inspections included disturbed areas that had not been permanently stabilized, areas used for storage of materials that were exposed to precipitation, structural control measures, and locations where vehicles entered or left the site. These areas were inspected for evidence of, or the potential for, pollutants impacting runoff.

3.7 Air Quality

The ROD did not specify performance requirements for air quality during implementation of the remedial action at the TPS Site. Data collected during the removal action at the Upper Reach of Chattanooga Creek generally indicated that air quality was not impacted as a result of excavation. While a permit was not required by the Hamilton County Air Pollution Control Bureau, air quality monitoring was performed in accordance with good engineering practices.

A monitoring program was developed to provide data for evaluation so that activities could be modified if necessary to minimize adverse impacts to air quality. Impacts to air quality at locations downwind of active operations were evaluated based on analytical results and real-time field measurements using a photoionization detector (PID) and dust monitor. The project action levels established for the real-time monitoring were 15 parts per million (ppm) short-term exposure limit (STEL) for the PID and 50 milligrams per cubic meter (mg/m3) STEL for the dust monitor.

Two air monitoring locations were established for the project. One location was immediately downwind from the drying bed and a second location was in an area between the drying bed and residential properties downwind of operations. Real-time measurements were collected continuously during active operations at the two locations throughout completion of the project. The BWSC field representative checked the air monitoring equipment twice a day to ensure it was working properly and to document PID and dust monitor readings on the Daily QC Report. The action levels established for the PID and dust monitor were never exceeded during project implementation.

In conclusion, the construction QA/QC program utilized throughout the remedial action was sufficiently rigorous and was adequately complied with to enable EPA and TDEC to determine that all analytical results are accurate to the degree needed to assure satisfactory execution of the remedial action consistent with the ROD, the RD/RA Consent Decree, and all other EPA approved RD/RA technical submittals.

4.0 MONITORING RESULTS

Monitoring results associated with the construction QA/QC program during implementation of the remedial action were discussed above. No additional monitoring activities are required by the ROD or the RD/RA Consent Decree.

5.0 SUMMARY OF OPERATION AND MAINTENANCE

No long-term operation and maintenance activities are required by the ROD or the RD/RA Consent Decree.

6.0 FIVE YEAR REVIEW

Discretionary Five-Year Reviews will be conducted by EPA to assess whether the protective isolation barrier continues to function as an effective engineering control to isolate the creek from the nearby NAPL source in the oxbow area. As noted previously, Operation and Maintenance and monitoring are the responsibility of the Southern Wood Piedmont facility under the Resource Conservation and Recovery Act (RCRA) through the Final RCRA Post-Closure Permit for the SWP facility that is delegated to the TDEC. The triggering date for the discretionary FYR is five years from the formal authorization to proceed on October 12, 2005. There have been 2 FYRs in 2011 and 2016.

7.0 SITE COMPLETION CRITERIA

The remedy implemented at the TPS site has achieved the degree of cleanup and protection specified in the ROD, as modified by the ESD, for all exposure pathways of concern. All selected remedial and removal actions, remedial action objectives and associated cleanup goals are consistent with agency policy and guidance. No further Superfund response is needed to protect human health and the environment.

Additional measures to control subsurface NAPL migration from adjacent areas are necessary to ensure the long-term protectiveness of the Chattanooga Creek remedial action. Southern Wood Piedmont (SWP) conducted some corrective action at the facility under the Resource Conservation and Recovery Act (RCRA) that is delegated to TDEC. The September 2005 RCRA post-closure permit for the SWP facility indicates that the need for further corrective action in the oxbow and floodplain of Chattanooga Creek (e.g. AOC A) will be evaluated after the CERCLA cleanup is finished. Project documentation of conditions in this reach of Chattanooga Creek indicates there is substantial, residual NAPL mass in the subsurface that could be targeted for removal via passive or active source removal strategies. At this time, EPA believes the TDEC RCRA Program is the most appropriate regulatory authority to evaluate and develop longer term source control strategies for NAPL present in the subsurface of the floodplain and oxbow section of Chattanooga Creek adjacent to the SWP facility.

8.0 BIBLIOGRAPHY

- Final Record of Decision for the Tennessee Products NPL Site; US EPA Region 4 (September 2002).
- Explanation of Significant Differences for the Tennessee Products NPL Site; US EPA Region 4 (August 2004).
- Remedial Design/Remedial Action Federal Consent Decree (May 2005).
- Remedial Design Work Plan, Revision I; Envirocon/BWSC (June 2005).
- Remedial Action Work Plan, Revision 1; Envirocon/BWSC (September 2005).
- Remedial Action Work Plan - Supplement for Modified Statement of Work; Envirocon/BWSC (September 2006).
- Final Remedial Design and Project Drawings; Envirocon/BWSC (October 2005).
- Project Quality Management Plan, Revision 1; Envirocon/BWSC (September 2005).
- Project Quality Management Plan - Supplement for Modified Statement of Work; Envirocon/BWSC (September 2006).
- Storm Water Pollution Prevention Plan, Revision 1; Envirocon/BWSC (September 2005).
- Final Remedial Action Report; Envirocon/BWSC (January 2008).
- Chattanooga Creek NAPL Assessment; US EPA Region 4 (June 2006).

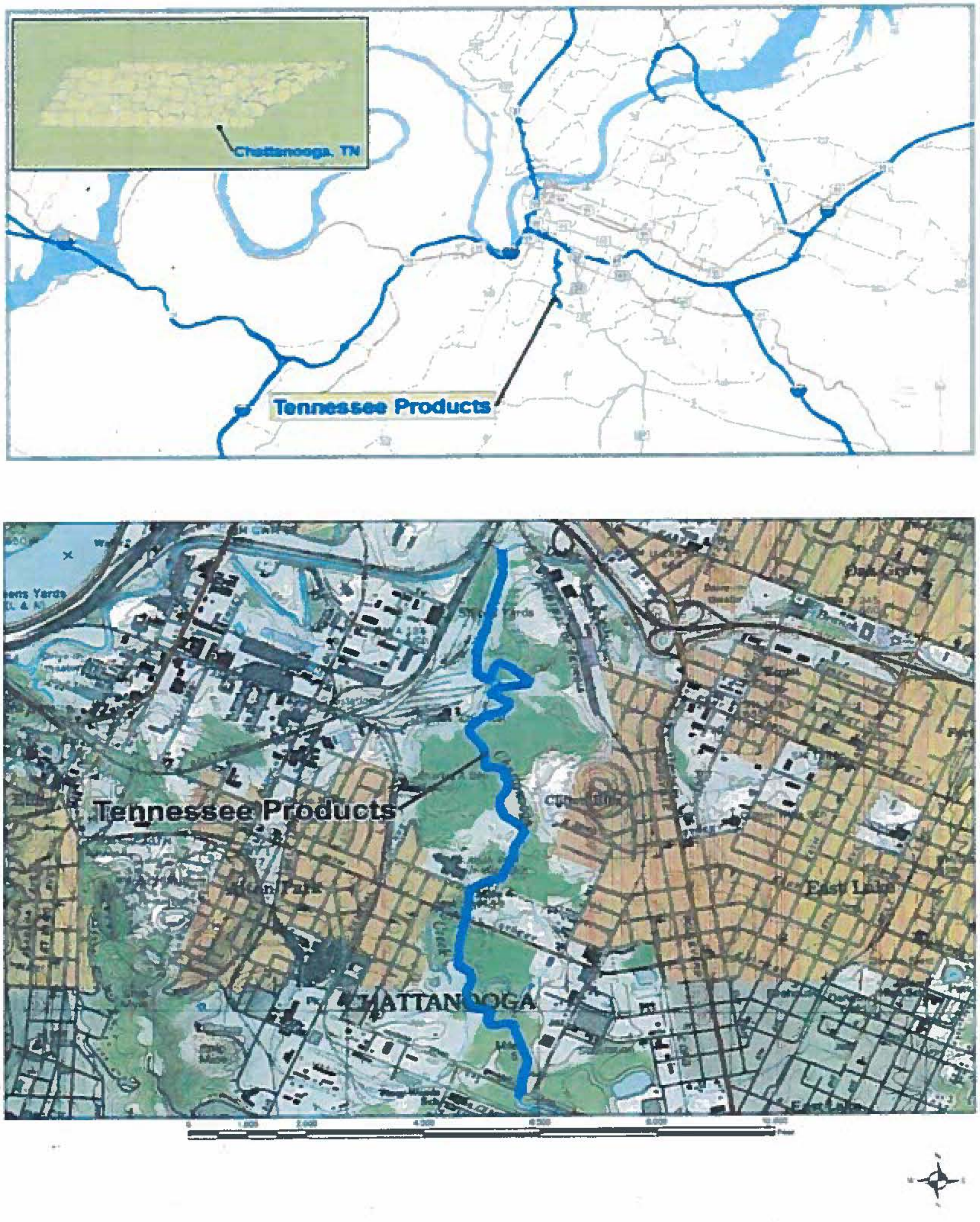


Figure 1: General Site Location

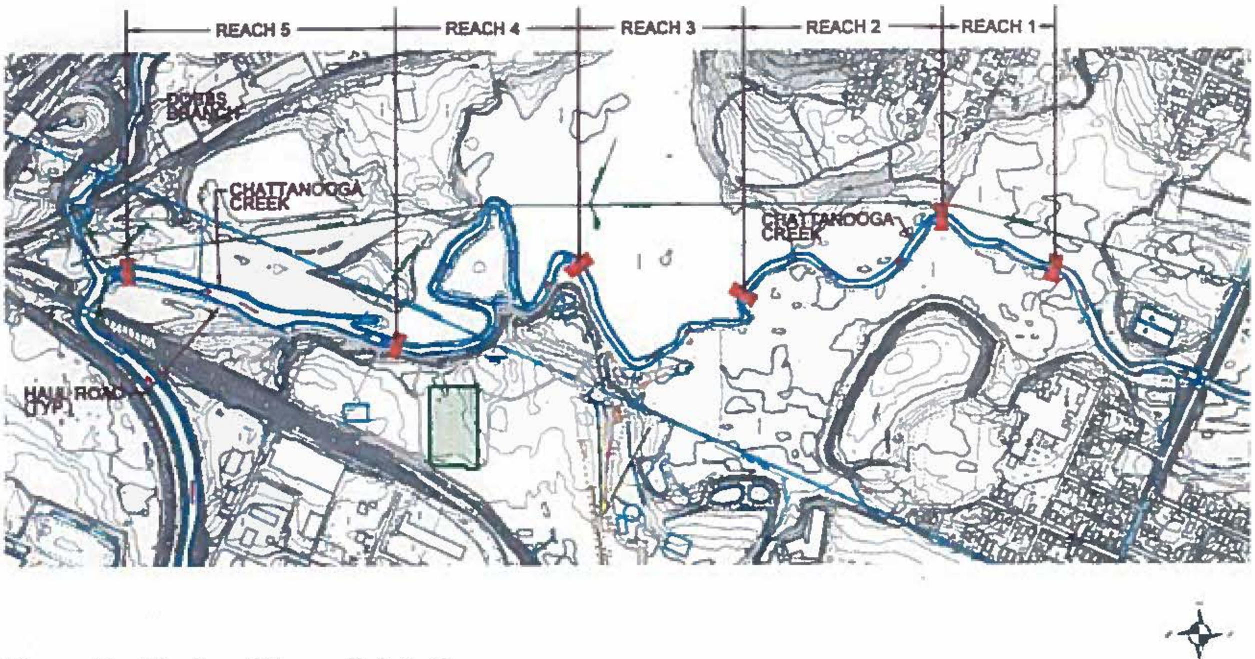


Figure 2: Limits of Remedial Action

Five-Year Review Report

First Five-Year Review Report
for
Tennessee Products Superfund Site
EPA ID # TND071516959

Chattanooga
Hamilton County, Tennessee

September 2011

Prepared By:
TDEC-DoR.
540 McCallie Ave, Suite 550
Chattanooga, Tennessee 37402

For:
United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by: Date:

for 9/27/11

Franklin E. Hill
Director, Superfund Division

10802756

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Appendix B: Press Notices

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Appendix D: Memorandum from Dr. Danny Reible, Interim Report – Chattanooga Creek, TN 2010 Sampling

Tables

Figures

List of Acronyms

4C	Chattanooga Creek Cleanup Committee, LLC
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BTEX	benzene, toluene, ethylbenzene, and xylenes
BWSC	Barge, Waggoner, Sumner and Cannon, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COCs	Chemicals of Concern
DoR	Division of Remediation
EC's	Engineering Controls
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
ICs	Institutional Controls
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated biphenyls
PDMS	Polydimethylsiloxane
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SESD	Science and Ecosystems Support Division SESD
SI	Site Inspection
SPME	Solid Phase Micro Extraction
TAL	Target Analyte List
TCL	Target Compound List
TDEC	Tennessee Department of Environment and Conservation
TDWQC	Tennessee Division of Water Quality Control
TPS	Tennessee Products Superfund Site
TVA	Tennessee Valley Authority

Executive Summary

Introduction

This is the first Five-Year Review (FYR) for the Tennessee Products Superfund Site (TPS). The triggering action for this statutory review is the on-site construction start date of the remedial action, which was October 12, 2005. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one Operable Unit, which was addressed in two remedial action phases of work, all of which are addressed in this FYR.

The TPS Site includes approximately a 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex and adjacent industrial facilities in an urban industrial and residential area of south Chattanooga were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of Chattanooga Creek sediments. Numerous discharges of contaminated water to Chattanooga Creek via tributaries were documented. Results of previous investigations and subsequent evaluations indicated that then existing conditions posed an unacceptable risk to human health, if exposure to the contaminated sediments were to occur.

The TPS Site is surrounded by mixed use areas, consisting of commercial, residential and industrial. Although most of the Site is fairly isolated and inaccessible to residents due to being surrounded by wooded floodplain, portions of the Site may be accessed by road crossings at two locations.

In order to minimize risks posed by the contaminants to human health and the environment, a remedy was chosen that consisted of a combination of the following: excavation, stabilization, treatment, recycling, offsite disposal and stream restoration. During the first phase of removal, emphasis was placed on waste-to-fuel recycling of the excavated and stabilized sediments. Due to changing economic conditions and associated cost constraints, the second phase of remedial work opted for chemical stabilization and offsite disposal of the excavated sediments in lieu of recycling. In situations where excavation was not practicable, the sediments were covered in place and physically stabilized.

Remedial Action Objectives

The Remedial Actions Objectives (RAO's), as specified in the Record of Decision (ROD) are:

- Minimize direct contact by the public and workers with soil and sediments containing excessive levels of Chemicals of Concern (COCs).

- Minimize direct contact by the public and workers with surface water containing excessive levels of COCs.

- Minimize direct contact by the public and workers with groundwater containing excessive levels of COCs.

- Minimize transport of contaminated soil and sediment by erosion to water courses, including the Tennessee River.

• Minimize potential for leaching of COCs to groundwater from areas of high concentration.

Technical Assessment

Conclusions from the Solid Phase Microextraction (SPME) monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. Therefore, the implemented remedy at the TPS remains protective of both human health and the environment.

However, the EPA ORD task order only included annual SPME monitoring for three years in 2009, 2010, and 2011. There should be some mechanism in place for continued monitoring and regular inspections to ensure the future protectiveness of this remedy. The most appropriate mechanism is likely the TDEC RCRA Post-Closure Permit for the SWP facility, which is where the AquaBlock® installation lies.

On November 23, 2010, EPA submitted official comments to TDEC on the planned modification of SWP's Post-Closure permit. The substance of those comments was that the modified permit should require SWP to take some regular action toward ensuring that the barrier in the creek remains effective. On June 13, 201, and again on September 12, 2011, personnel from the EPA Region 4 Superfund Division met with representatives from Southern Wood Piedmont (SWP) and the Tennessee Department of Environment and Conservation (TDEC) RCRA Program to discuss the requirements of the TDEC RCRA Post Closure Permit for the SWP facility. EPA proposed to SWP and TDEC that future inspection and monitoring of the AquaBlok® cap performance should be included in the Final RCRA Post Closure Permit issued by TDEC. The Final permit for the SWP facility was not issued by the time this FYR was issued, so follow up with SWP representatives and the TDEC RCRA program is required to verify that inspection and monitoring were incorporated.

Conclusion

Two years of SPME monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Porewater concentrations in the upper layers of the cap are very low (e.g. in the parts per trillion range) and do not exceed chronic surface water quality criteria. It is important to note that comparisons of porewater concentrations to surface water quality criteria is very conservative in that substantial dilution would be expected between porewater and surface water. Moreover, there is little change between the 2009 and 2010 PAH concentrations in the cap material suggesting that no significant migration of contaminants is occurring up through the AquaBlok® barrier. Therefore, the remedy implemented at the Tennessee Products Site remains protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Tennessee Products

EPA ID *(from WasteLAN)*: TND071516959

Region: 4 | **State:** TN | **City/County:** Chattanooga, Hamilton County

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify)

Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ☒ Complete

Multiple OUs?* ☐ YES ☒ NO | **Construction completion date:** 09/13/2007

Has site been put into reuse? ☐ YES ☒ NO

REVIEW STATUS

Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency

Authors names: Troy Keith[1], Craig Zeller[2]

Author title: [1]Environmental Field Office Manager, [2]Remedial Project Manager | **Author affiliation: [1]Tennessee Department of Environment and Conservation-Division of Remediation, [2]EPA Region 4**

Review period**: 10/11/2010 to 09/30/2011

Date(s) of site inspection: 10/27/2009 and 11/01/2010

Type of review:

☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☒ 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify) ________

Triggering action:

☐ Actual RA Onsite Construction at OU# ☒ Actual RA Start at OU# 1
☐ Construction Completion ☐ Previous Five-Year Review Report
☐ Other (specify)

Triggering action date *(from WasteLAN)*: 10/12/2005

Due date *(five years after triggering action date)*: 10/12/2010

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form continued

Issues:

1. There should be some mechanism in place for continued monitoring and regular inspections to ensure future protectiveness of this remedy.

Recommendations:

1. Follow up with Southern Wood Piedmont (SWP) and TDEC RCRA Program from 06/14/11 and 09/12/11 meetings to verify that inspection and monitoring of the AquaBlok® cap was incorporated into Final RCRA Post Closure Permit for the SWP Facility.

Protectiveness Statement:

The remedy implemented at the Tennessee Products Site currently protects human health and the environment. Two years of Solid Phase Microextraction (SPME) monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Porewater concentrations in the upper layers of the cap are very low (e.g. in the parts per trillion range) and do not exceed chronic surface water quality criteria. It is important to note that comparisons of porewater concentrations to surface water quality criteria is very conservative in that substantial dilution would be expected between porewater and surface water. Moreover, there is little change between the 2009 and 2010 PAH concentrations in the cap material suggesting that no significant migration of contaminants is occurring up through the AquaBlok® barrier. However, in order for the remedy to be protective in the long term, there needs to be a mechanism in place to ensure regular inspection and monitoring of the barrier's effectiveness. To that end, EPA has requested that TDEC include the necessary inspection and monitoring requirements to the TDEC RCRA Post-Closure Permit for the SWP facility.

Other Comments: None

First Five-Year Review Report
Tennessee Products Superfund Site

1.0 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to Section 121 of the the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."

The Tennessee Department of Environment and Conservation (TDEC), Division of Remediation (DoR), conducted the FYR and prepared this report regarding the remedy implemented at the Tennessee Products Site in Chattanooga, Hamilton County, Tennessee. This FYR was conducted from October 2010 to December 2010. EPA Region 4 is the lead agency for developing and implementing the remedy for the Potentially Responsible Party (PRP)-financed cleanup at the Site.

This is the first FYR for the Tennessee Products Site. The triggering action for this statutory review is the on-site construction start date of October 12, 2005 for the remedial action. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one Operable Unit, which was addressed in two remedial action phases of work, all of which are addressed in this FYR. Phase I was a non-time critical removal that took place in 1997 and 1998, prior to the ROD. The Phase II remedial action took place from 2005 through 2007, after the ROD was issued.

2.0 Site Chronology

The following table lists the dates of important events for the Tennessee Products Superfund Site.

Table 1: Chronology of Site Events

CHRONOLOGY OF EVENTS	
DATE	**DESCRIPTION OF EVENT**
June 1, 1981	Discovery
January 1, 1983	Preliminary Assessment
June 1, 1984	Site Inspection
November 2, 1990	Site Inspection
September 8 – October 10, 1993	Removal Action
January 18, 1994	Proposal to the National Priorities List (NPL)
September 29, 1995	Finalized on the NPL
June 24, 1997 – December 4, 1998	Removal Action
April 12, 2002	EPA and 4C enter into an Administrative Order on Consent for the Remedial Design/Remedial Action (RD/RA)
September 30, 2002	Remedial Investigation/Feasibility Study (RI/FS) completed Record of Decision (ROD) Signed
August 3, 2004	Explanation of Significant Difference (ESD)
May 4, 2005	RD/RA Consent Decree Filed
May 10, 2005	Barge, Waggoner, Sumner, and Cannon, Inc. (BWSC) Health and Safety Plan, Preconstruction Survey Work Plan, and Remedial Design Work Plan Submitted
May 27, 2005	Preliminary Design Drawings and Document Submitted
June 15, 2005	Envirocon Health and Safety Plan Submitted
June 22, 2005	Stakeholders Meeting Held

July 14, 2005	State of Tennessee Special Waste Application Submitted
July 26, 2005	Remedial Action Work Plan Submitted
August 2005	Access Agreements Reached with all Landowners
August 2, 2005	Storm Water Pollution Prevention Plan Submitted
September 6, 2005	Project Orientation and Mobilization to Site
September 20, 2005	Pre Construction Meeting and Public Meeting Held
September 23, 2005	Project Quality Management Plan Submitted
October 3, 2005	Background Air Monitoring at Perimeter Completed
October 7, 2005	Final Design Drawings and Document Submitted
October 11, 2005	Background Air Samples Collected
October 11 – 20, 2005	Comparison Water Samples From Upstream of Project Limits Collected
October 12, 2005	Authorization to Proceed with Full Scale Remediation Received from EPA
October 26, 2005	Representative Samples from Northeast Tributary Area Prior to Excavation Collected
November 1, 2005	Project Status Presentation to Chattanooga City Council
November 2, 2005	Media Day Held
November 10, 2005	Verification of Performance Standard Obtainment for Station 12+75 to Station 22+50 (Stream Reach 1) Completed
December 1, 2005	Confirmation Samples from Northeast Tributary Area Collected
December 14, 2005	Verification of Performance Standard Obtainment for Station 60+00 to Station 61+00 (Bypass) Completed
December 27, 2005	Removal at Northeast Tributary Confirmed Complete
January 6, 2006	EPA and TDEC Performed Inspection of Changed Conditions (mobile Non-Aqueous Phase Liquid (NAPL)
January 31, 2006	Envirocon Demobilization for Winter Shutdown Complete (Security and Inspections Continue)

March 6 – 20, 2006	EPA Performs Site Investigation Related to NAPL
March 8, 2006	Envirocon Remobilization to Site; Winter Shutdown Concluded
May 24, 2006	Verification of Performance Standard Obtainment for Station 22+50 to Station 29+50 (Stream Reach 2) Completed
June 13, 2006	Verification of Performance Standard Obtainment for Station 29+50 to Station 40+00 (Stream Reach 2) Completed
June 20, 2006	Statement of Work Modified by EPA
June 22, 2006	Request to Modify Project Quality Management Plan Tab B-Performance Standards Verification Plan Submitted
July 8, 2006	Special Waste Recertification Submitted
July 28, 2006	Verification of Performance Standard Obtainment for Station 40+00 to Station 57+50 (Stream Reaches 3 & 4) Completed
August 29, 2006	EPA Approves the Use of AquaBlok® as an Isolation Barrier
September 1, 2006	Verification of Performance Standard Obtainment for Station 57+50 to Station 77+00 (Stream Reach 4) Completed
September 12, 2006	Verification of Performance Standard Obtainment for Station 77+00 to Station 80+00 (Stream Reach 4) Completed
September 15, 2006	Remedial Action Plan – Supplement for Modified Statement of Work and Project Quality Management Plan – Supplement for Modified Statement of Work Submitted and Notification by EPA for Suspension of Excavation Work in Reach 5 until 2007
November 28, 2006	Isolation Barrier Verification of Performance Standard Obtainment for Station for 45+00 to Station 80+00 Completed
December 15, 2006	Envirocon Demobilization for Winter Shutdown Complete (Security and Inspections Continue)
April 16, 2007	Envirocon Remobilization to Site; Winter Shutdown Concluded
May 21, 2007	Verification of Performance Standard Obtainment for Station 80+00 to Station 83+25 (Stream Reach 4) Completed
May 31, 2007	Verification of Performance Standard Obtainment for Station

	83+25 to Station 85+25 (Stream Reach 4) Completed
June 8, 2007	Special Waste Recertification Submitted
June 14, 2007	Verification of Performance Standard Obtainment for Station 85+25 to Station 88+00 (Stream Reaches 4 & 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 80+00 to Station 83+25 Completed
June 21, 2007	Verification of Performance Standard Obtainment for Station 88+00 to Station 90+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 83+25 to Station 85+25 Completed
June 28, 2007	Verification of Performance Standard Obtainment for Station 90+00 to Station 93+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 85+25 to Station 88+00 Completed
July 11, 2007	Verification of Performance Standard Obtainment for Station 93+00 to Station 95+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 88+00 to Station 93+00 Completed
August 7, 2007	Verification of Performance Standard Obtainment for Station 95+00 to Station 100+00 (Stream Reach 5) Completed
August 14, 2007	Verification of Performance Standard Obtainment for Station 100+00 to Station 102+50 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 93+00 to Station 95+00 Completed
August 23, 2007	Isolation Barrier Verification of Performance Standard Obtainment for Station for 95+00 to Station 102+50 Completed and Pre-Final Construction Inspection Completed
September 6, 2007	Pre-Final Construction Report Submitted
September 13, 2007	Final Inspection Completed
September 14, 2007	Envirocon demobilizes from the Site

October 25, 2007	Public Meeting Held
September 26, 2008	Close Out Report
October 27.2009 through November 10, 2009	Samples Collected from Isolation Barrier
November 1, 2010 through November 17, 2010	Samples Collected from Isolation Barrier

3.0 Background

3.1 Physical Characteristics

Chattanooga Creek originates from the slopes of Lookout Mountain in Georgia, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River upstream of Nickajack Reservoir. The creek is a gaining stream throughout its course. The majority of tributaries enter the creek in Georgia with the exception of Dobbs Branch, which enters Chattanooga Creek three miles upstream of the mouth of the creek. Figure 1 depicts the location of the TPS Site in relation to regional and local surroundings. Figure 2 depicts the TPS site, via aerial photo coverage, in relation to its immediate surroundings.

The TPS Site includes approximately a 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex and adjacent industrial facilities in an urban industrial and residential area of south Chattanooga were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of Chattanooga Creek sediments. Numerous discharges of contaminated water to Chattanooga Creek via tributaries were documented. Results of previous investigations and subsequent evaluations indicated that existing conditions posed an unacceptable risk to human health, if exposure to the contaminated sediments were to occur.

The TPS Site is surrounded by mixed use areas, consisting of commercial, residential and industrial. Although most of the Site is fairly isolated and inaccessible to residents due to being surrounded by wooded floodplain, portions of the Site may be accessed by road crossings at two locations.

The only environmentally sensitive areas associated with the site are the wetlands that occupy topographically low areas of the adjacent floodplain. Chattanooga Creek is an impaired stream (303D) as a result of upstream agricultural runoff and other anthropological inputs, such as junk yards and sewer overflows.

Figure 1: Location Map for the Tennessee Products Superfund Site

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding EPA's response actions at the site, and is not intended for any other purpose."

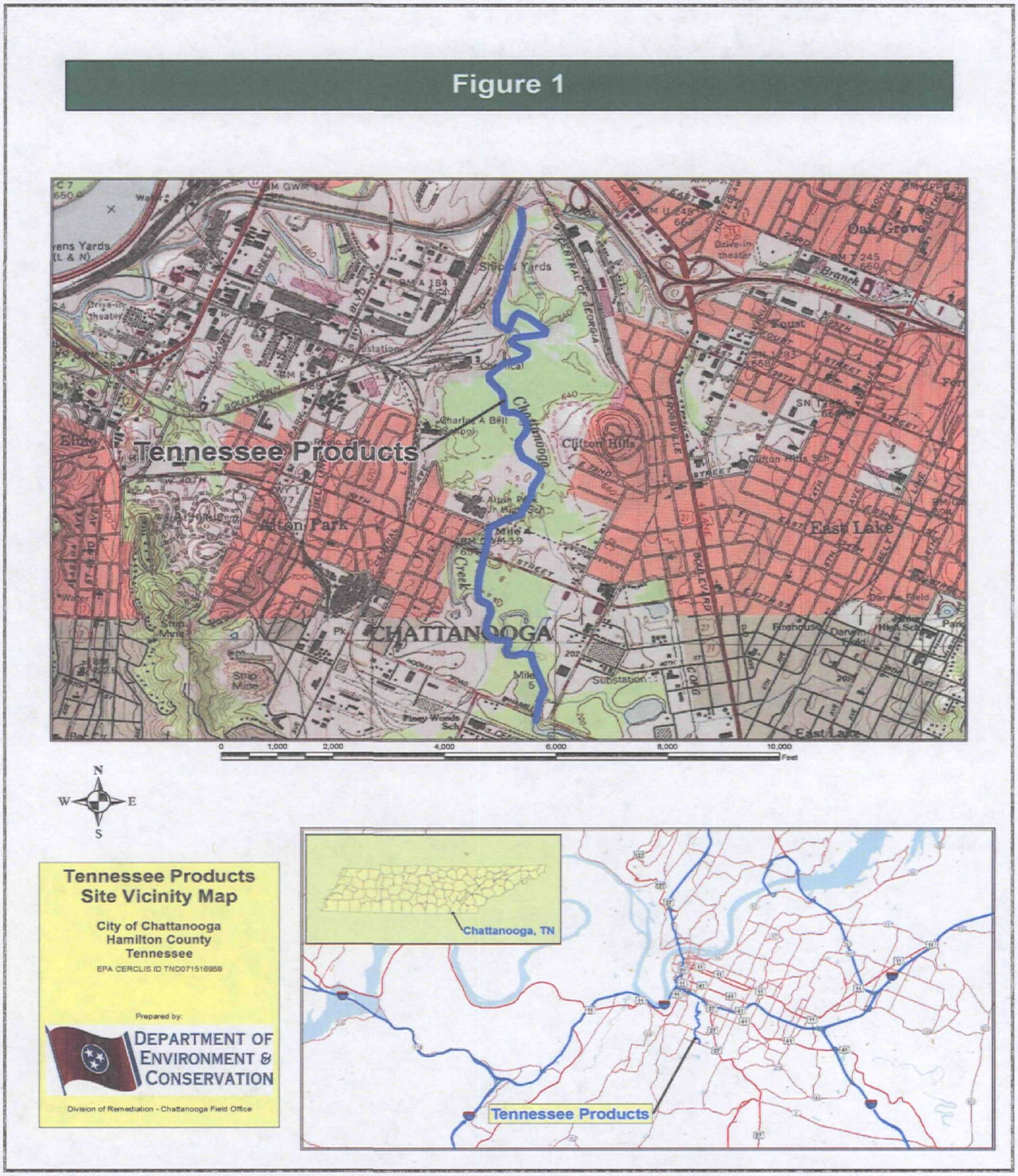
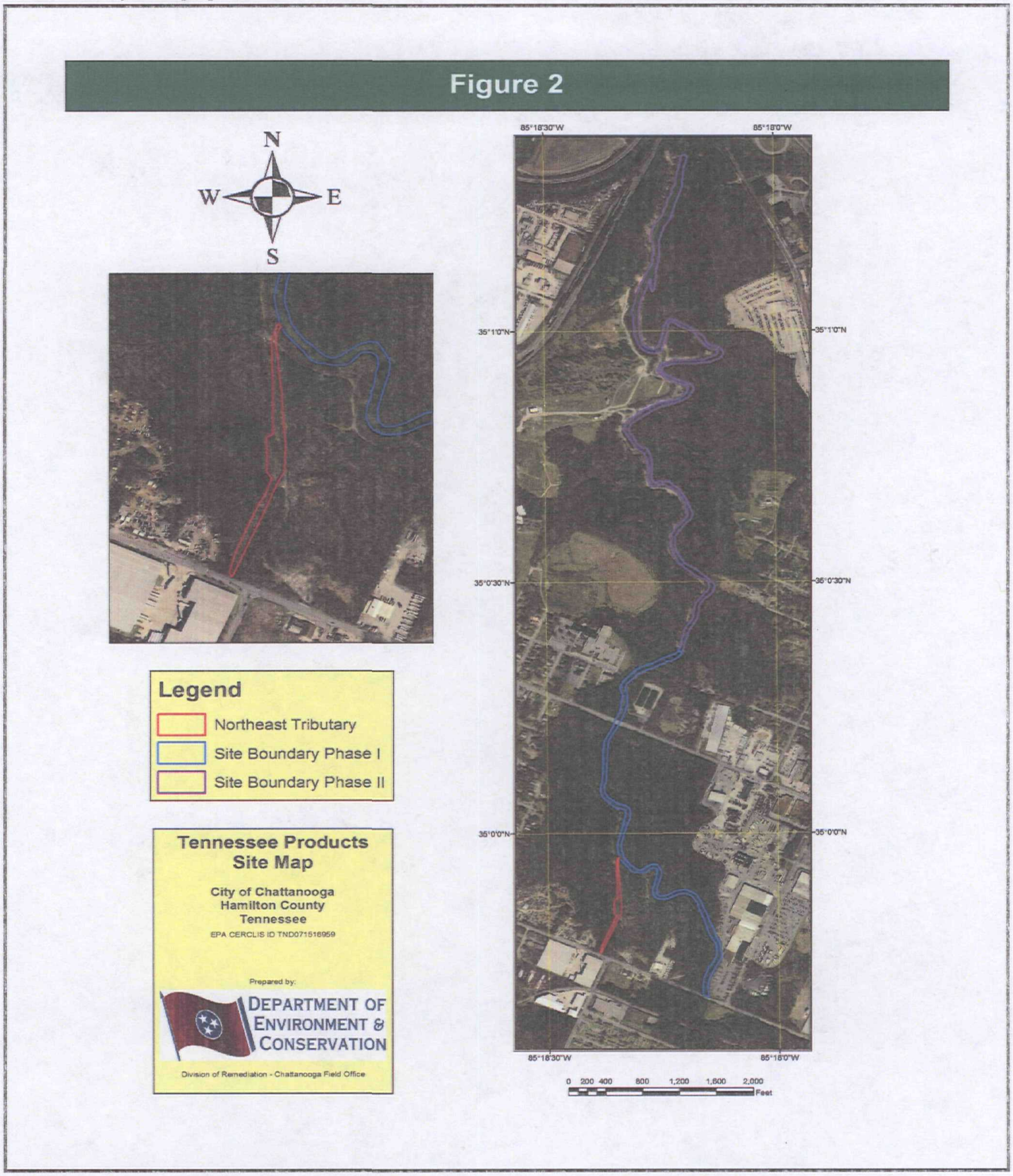


Figure 2: Detailed Map of the Tennessee Products Superfund Site

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding EPA's response actions at the site, and is not intended for any other purpose."



3.2 Land and Resource Use

Land Use

The Tennessee Products Superfund site is located in a populated area immediately west of downtown Chattanooga, Tennessee. An assessment of current land usage adjacent to the Site was conducted during the Remedial Investigation. The TPS Site is located in the South Side Area Planning District as designated by the Chattanooga-Hamilton County Regional Planning Agency. The boundaries of the South Side Planning District are defined to the north by I-24, to the south by the State line, to the east by Chattanooga Creek, and to the west by Lookout Mountain.

Prior Land Use

According to 1994 data compiled by the Planning Agency, the land use for this area was: (1) 20% residential; (2) 10% industrial; (3) 27% vacant (i.e., either on steep slopes or in the floodplain); (4) 6% commercial; (5) 5% institutional; (6) recreation; and (7) 23% other (i.e., including streets, water, utilities). Interspersed within the industrial facilities are several housing projects and many individual residences.

Current Land Use

Land use essentially are the same as they were they were at the time of the ROD.

Projected Land Use

Projected land use for this area is: (1) 25% residential; (2) 16% industrial; (3) 4% commercial; (4) 2% institutional; (5) 32.5% recreation; and (6) 20% other (i.e., including streets, water, utilities). The Chattanooga-Hamilton County Regional Planning Agency did not project the "Vacant" category percentage, as it is assumed that it will be incorporated into the future Residential, Commercial and Recreational uses.

Ground and Surface Water Uses

Prior Resource Use

At the time of the ROD, private drinking water wells were not known to exist within a 4-mile radius of the Site. Drinking water for the area was supplied by the Tennessee-American Water Company whose intake is on the Tennessee River approximately four (4) miles upstream of the confluence of Chattanooga Creek and the Tennessee River. Groundwater was not generally used for irrigation or livestock watering. The closest active industrial wells (1999) to the Site were Southern Cellulose Products' two wells (both 150 feet deep) on 38th Street, and the Chattanooga Glass Company well (325 feet deep) on West 45th Street. There were no known nearby surface water withdrawals (for drinking water) located downstream of the Site in Chattanooga Creek or the Tennessee River. The closest downstream public water withdrawal intake was located at South Pittsburg, Tennessee, on the Tennessee River, approximately 30 river-miles downstream from the confluence of Chattanooga Creek and the Tennessee River. Chattanooga Creek was used for swimming, playing, and fishing by both children and adults, although warning signs have been posted. Consumption of fish caught from the Creek has been reported, also despite warning signs. In addition, homeless people are reported to sometimes bathe in the Creek and to drink Creek water.

Current Resource Use

With exception of the Chattanooga Glass Company well (325 feet deep) on West 45th Street, resource uses are essentially the same as they were they were at the time of the ROD. The Chattanooga Glass Company is no longer in operation, so it is presumed that the well is no longer in use.

Projected Resource Use

Resource use is not expected to change in the foreseeable future.

Hydrogeology and Hydrology

Groundwater in the region occurs within both the unconsolidated and consolidated materials. The unconsolidated materials include the alluvial deposits and residuum described above. These materials generally have low water yield and are thus not considered an important groundwater source.

The consolidated materials consist of shale, sandstone, limestone, and dolomite that form the bedrock. Water in limestone typically occurs in secondary features such as fractures and bedding planes, particularly those that have been enlarged by solution of calcareous material. These features occur erratically and cause hydraulic conductivities to be extremely variable throughout the region. This property explains why one well may be dry and another nearby well at the same depth into the bedrock produces water. Typically, most of the water encountered in limestone is near the top of the rock where weathering has increased the number of secondary features.

Shales generally have low yields. Sandstones, particularly those on Lookout Mountain, may yield large quantities of water. Limestones and dolomites produce variable amounts of water depending on the number and size of fractures and solution cavities encountered. In general, the most productive aquifers in the region are the formations of the Knox Group.

Groundwater is recharged primarily by the percolation of rainwater through the soils. Generally, groundwater discharges locally to ponds, streams (such as Chattanooga Creek), springs, and by general seepage.

Chattanooga Creek is in the Tennessee River basin, which is regulated by a series of dams along the River and large tributary dams in the headwaters. Chattanooga Creek originates from the slopes of Georgia's Lookout Mountain, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River just downstream of downtown Chattanooga, and above Nickajack Reservoir. Nickajack Lake is the result of the Tennessee Valley Authority (TVA) constructing a hydroelectric dam at River Mile 425. The Creek is a gaining stream throughout its course and in its Georgia headwaters is fed by several springs. Some of the more notable springs feeding it are Powder Mill, Tannery, Crutchfield, and Blowing. The majority of contributing tributaries also enter the Creek's base flow in Georgia, except for Dobbs Branch, which is three miles upstream from the mouth of the Creek. In its entirety, the Chattanooga Creek has a watershed of nearly 75 square miles, of which approximately twenty (20) per cent is in Tennessee. It occupies the northern portion of the Chattanooga Valley between Lookout Mountain and Missionary Ridge.

Average annual streamflow in Chattanooga Creek in Tennessee is on the order of 100 cubic feet per second (cfs). The Creek falls about 1.5 feet per mile and is relatively shallow, usually not over 4 feet deep and in many places much less, on the order of 3 to 4 inches, depending on the time of year. The average depth appears to be 2 to 4 feet, except where artificially deepened. In the extremely shallow areas, a brisk current is evident, but along most of the length of Creek in Tennessee, the current is scarcely discernable. The stream banks appear to average approximately 2 to 4 feet, except where artificially heightened. Occasional flooding occurs, as evidenced by trash entangled in trees and bushes 3 to 4 feet above the normal stream level.

The topography of the surrounding area of Chattanooga Creek is rough and mountainous, promoting a special susceptibility of the stream to overflow due to heavy, short duration, spring and summer storms. Floodplain development is considered to be heavy in the Chattanooga Creek basin. Backwater from severe Tennessee River floods could extend up the entire length of Chattanooga Creek. Headwater flooding prevails along Chattanooga Creek, but has not been a major problem. In the past, as recently as March 2003, Tennessee River backwater has caused heavy flood damage to the highly developed floodplain.

3.3 History of Contamination

3.3.1 Historical Origin of Contamination

3.3.1.1 Coke Plant

The coke production processes at the former Tennessee Products Coke Plant (Coke Plant) over its 82-year history (1913-1995) have led to the environmental problems in nearby areas, including Chattanooga Creek. Briefly, coal carbonization removes gases from coal by heating. This process changes coal to coke, which is used for industrial purposes. The off-gases were used for residential heating and lighting. A typical coke oven produced 80 % coke, 12 % coke-oven gases, 3 % coal tar (containing primarily phenols, naphthalene, and other various PAHs), and 1 % light oils (such as benzene, toluene, and xylene). The only known regulated hazardous waste generated by the coke production process is a decanter tank car sludge (i.e., waste K087) which contains primarily phenol and naphthalene. The waste handling procedures used by the Coke Plant over its 82-year history are uncertain. However, uncontrolled dumping of coal tar wastes off-site was apparently a procedure used at one time as is indicated by the discovery of the Chattanooga Creek Tar Deposit and the Hamill Road Dumps. In December 1993, EPA conducted a search for other coal tar waste deposits along the floodplain of Chattanooga Creek between 38th Street and Hooker Road Bridge, on the west side of the Creek, but no additional sites were found.

Although not a direct waste disposal method, numerous discharges of contaminated surface water to the northeast and northwest tributaries have been documented from 1977 until 1990. These tributaries flow from the Coke Plant and discharge to the Creek 1,800 feet downstream of the Creek's intersection with Hamill Road Bridge. The contaminated surface water contained significant levels of PAHs, phenols, oil, and grease, ammonia, and metals. In addition, the Coke Plant reportedly maintained a private sewer line that discharged wastewaters directly to Chattanooga Creek 1 and 1/8 miles from the plant. This sewer existed in 1944 and appears on a 1967 diagram of the Plant. The sewer was constructed and used by both the Chattanooga Coke and Gas Company and the Tennessee Products Corporation, which dates its operation and use to as early as 1926. There is evidence that the sewer line was also used by the Reilly Tar and Chemical Company. Reportedly, the sewer line terminated at the Creek just upstream of the Hamill Road Bridge. Based on the results of geophysical surveying conducted during the Remedial Investigation, the sewer line still exists beneath both the Coke Plant and the Velsicol facility. However, instead of discharging directly into Chattanooga Creek, the sewer line appears to have been rerouted such that it now terminates at the Northeast Tributary, just south of the railroad tracks traversing through the middle of the Landes Company site.

EPA conducted two aerial photographic studies of an area surrounding the Tennessee Products Site. One analysis was to identify potential locations of coal tar deposits in the vicinity of Chattanooga Creek. The purpose of the other analysis was to document past waste disposal activities and other environmentally significant events on and near the Coke Plant.

Up to 23 aerial photographs spanning a period from 1935 through 1994 were analyzed. The analysis identified suspected disposal areas, impoundments, staining, tanks, debris, coal storage areas, open storage areas, containers and drums, mounded material which may represent waste piles, probable vegetation damage due to surface run-off from the Site areas, and discharges to surface drainage pathways.

In general, the aerial photographs showed the nature of the activities onsite. On the Tennessee Products Site, the old Coke Plant area, the photographs clearly showed coal storage, processing, and loading areas, as well as dark staining on the ground throughout the Coke Plant area.

In addition, several of the aerial photos showed mounded dark materials on both sides of the railroad tracks at the eastern corner of the Coke Plant. Open storage and debris piles were also evident in this general area on several aerial photos. In the 1958 aerial photo, an area to the south and across the railroad tracks from the mounded material is an area which appears as stressed vegetation. The distressed vegetation area is larger in the 1964 aerial photo. An oil/water separator was visible on the 1973 aerial photo and was located on the Coke Plant side of the railroad tracks in the aforementioned area. The installation of the oil/water separator indicated a wastewater discharge. The overflow from this oil/water separator would flow northward in a ditch that follows the railroad track. This ditch leads to the Northeast Tributary via a culvert under the railroad tracks.

The coke production process and the migration off-plant of production products and residues are responsible for a wide variety of contaminants at other Site areas, including the Creek. These contaminants include, but are not limited to, a wide variety of PAHs, including lighter chemicals such as benzene, toluene, ethyl benzene, and xylene (BTEX), and metals.

3.3.1.2 Reilly Tar Facility

The Reilly Tar property had been used to produce coal tar products (i.e., road tar and ruffing pitch and other coal tar pitches) from 1921 to 1976. The tar products were made from the by-products of the adjacent coke production plant. In 1976 Velsicol purchased a parcel of land from Reilly Tar and Chemical.

3.3.1.3 Velsicol Chemical Facility

The original facility at the Velsicol main plant site was constructed in 1948 by the Tennessee Products Corporation to expand toluene chlorination operations from the adjacent coke plant.

Velsicol purchased the facility from the TPC in 1963. At the time of the purchase, the following chemicals were being produced at the plant: benzoyl chloride, benzoic acid, benzyl chloride, benzyl alcohol, benzotrichloride, benzoate esters, benzoguanamine, benzonitrile, benzaldehyde, and sodium benzoate.

3.3.1.4 Southern Wood Piedmont

The Southern Wood Piedmont wood treatment facility operated from 1925 until 1988. It is located adjacent to the Middle Reach of the Chattanooga Creek below the 38th Street Bridge. Up until 1940 wastewater from the facility was discharged directly in the Creek. Later this wastewater was channeled into a wetland adjacent to the Creek and finally into a City sewer line.

3.3.2 Investigations

3.3.2.1 State and Federal Investigations and Enforcement

In 1973 and 1977, EPA conducted a number of studies in the Chattanooga area, including two which focused on Chattanooga Creek. The early studies centered on water quality, and did not address the Creek sediments. The major sources of contamination were identified, and the wastewater discharges, as well as Chattanooga Creek surface water, were characterized. These early studies included analyses of water for organic compounds.

In 1980, the Tennessee Valley Authority (TVA) conducted a special survey for toxic priority pollutants which included sediment samples. The findings indicated that much of the Creek sediment was contaminated. During this period an agreement was reached between EPA and Velsicol Chemical Company to prevent the migration of contaminants from the area known as "Residue Hill." Residue Hill is a capped landfill located south of the Site, which contains chemical residues and that were leaking leachate. The Hill was capped and a leachate collection system installed in an attempt to stabilize the Hill. The discovery of toxic materials in the Creek during the TVA study and the completion of the Velsicol project highlighted the need for further data to adequately characterize the Creek's water quality, contaminant concentrations in the sediment and aquatic biota. In order to address these data gaps, an aquatic life study was conducted by TDWQC during June 1981; EPA, TVA, and TDWQC performed a sediment study of the Creek during 1981 and a water quality study was done by TDWQC in July 1982. Results of these studies showed that the worst contamination in the Creek occurred between Creek mile (cm) 5.06 and cm 2.10. This stretch of the Creek included the Hamill Road Dump # 1 (i.e., HRD1) Site which contained a wide variety of organic compounds. Within this reach of the Creek also lies the sewer outfall and tributaries (Northeast and Northwest Tributaries) that for many years served as conduits for Velsicol Chemical, Reilly Tar (Reilly Industries, Inc.), and Coke Plant wastewater discharges into the Creek. A large deposit of PAH-contaminated soil/sediment was detected near Creek mile 4.47 at the confluence of the Creek and the Northeast Tributary. The sewer outfall was just upstream of the Hamill Street Bridge; reportedly, the sewer was in working order from 1944 onward and was abandoned at some unknown time decades later.

The Site was the subject of a June 1981 Discovery under the Superfund pre-remedial program. A Preliminary Assessment (PA) was completed by the TDEC, in January 1983 under the USEPA CERCLA PA/SI Cooperative Agreement with EPA Region 4. This assessment indicated that the Site had significant contamination, further studies were warranted, and the Site was a good candidate for the NPL. As a result, a high priority Site Inspection was conducted. A Site visit was made on May 8, 1986, and an inspection was performed on May 12, 1986 by the TDEC.

During 1990, a water quality and sediment study was completed by Dynamac Corporation for EPA on the Creek. Additionally, RCRA 3007 information request letters were sent to all facilities located along the Creek. Responses to these letters provided some information regarding potential sources of contamination from these industries. Results of the sediment study indicated that the areas previously identified during the 1980s were still contaminated to the same relative degree. The sediment study also concluded that the PAHs were the most abundant compounds detected, and that general water quality above Dobbs Branch (i.e., Upper and Middle Reaches) had slightly improved. The improvement can probably be attributed to elimination of wastewater discharges to the Creek, remediation of Hamill Road Dump # 1 and Hamill Road Dump # 3, partial remediation of the Southern Wood Piedmont site and the installation of an infiltration collection system at the 38th Street Dump. Comparisons of the 1980 and 1990 studies show that contaminant concentrations and stream conditions below Dobbs Branch (i.e., the Lower Reach) had not changed.

In mid-1992, the Science and Ecosystems Support Division (SESD) of the EPA, EPA contractors and TDEC collected sediment samples from the Georgia/Tennessee state line to the Creek's mouth at the Tennessee River. Following data collection, the EPA prepared the *Chattanooga Creek Sediment Profile Study Report*. The field effort was divided into two phases. Phase I consisted of collecting sixty sediment/soil samples, 13 water samples and one waste sample. This initial phase of the study indicated that the lower reaches of the Creek bed, from the Hamill Road Bridge downstream, are naturally underlain with a heavy clay deposit. The sampling also indicated that Creek sediments along the entire length of the Site are contaminated with coal tar derivatives. Less ubiquitous, and often associated with the mound deposits near the Hamill Road Bridge, are other VOCs indicative of chemical manufacturing/ processing. Other contaminants of concern sporadically found on-site are: BTEX compounds (i.e., benzene, toluene, ethylbenzene, and xylenes); pesticides; PCBs (polychlorinated biphenyls); and metals (i.e., chromium, mercury, lead, and barium). Water samples infrequently exhibited contamination and were shown to be nearly as clean as the control sample upstream of the heavily industrialized section of the Creek (i.e., upstream of the Upper Reach).

Phase II of the survey delineated and quantified the Creek sediments contaminated with coal tar derivatives from Hamill Road Bridge to Dobbs Branch. During this field effort, cross-sections were set up at intervals along this reach and core samples were taken down to natural alluvial materials. This enabled the EPA to get a profile of the Creek bed and extrapolate volumes of material which needed to be removed. The estimate derived from these studies predicted that 14,500 cubic yards of material would need to be removed from the streambed.

In 1993, the Agency for Toxic Substances and Disease Registry (ATSDR) issued a Public Health Advisory for Chattanooga Creek. The Health Advisory concluded that the "the presence of the coal tar in and around the creek poses a health and safety hazard." Because of the unrestricted access to a portion of the Creek, people could be exposed to Site-related contaminants through ingestion and dermal contact. The coal tar deposits are also physical hazards to adults and children that wander into these areas. ATSDR's recommendations were: (1) dissociate nearby residents from the coal tar deposits; (2) continue characterization studies of the Site; (3) consider the Site for inclusion on the NPL; (4) use appropriate EPA statutory or regulatory authority to take necessary actions; and, (5) consider other coal tar contaminated sites along the Creek for inclusion on the NPL. Based on this Health Advisory, EPA initiated a non-time-critical removal of the most accessible coal tar deposits along the Upper Reach of the Creek and at the former Southern Coke and Chemical plant site (i.e., the Coke Plant area). In 1996, EPA issued an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action, which was consistent with a planned long-term remedial action strategy. On September 26, 1996, EPA issued an Action Memorandum approving the proposed non-time-critical removal action as described in the EE/CA. After commencing the removal action, EPA recognized that volume of sediment contaminated with coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and August 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of Creek sediments contaminated with coal tar derivatives.

In June/July of 1997, the U.S. Army Corps of Engineers, working under a cooperative agreement with the EPA, had its primary contractor for the project, IT Corporation, perform a delineation of coal tar deposits in the Creek. The purpose of the delineation was to determine the distribution and quantities of coal tar in the Creek for the upcoming removal action. The delineation occurred along a 5,800 foot section of the Creek, starting at Hamill Road Bridge and ending 1,300 feet downstream of the East 38th Street Bridge, in the vicinity of Alton Park Junior High School.

Earlier, in March/April of 1997, IT Corporation had performed a delineation of coal tar deposits in the Creek starting approximately 1,350 feet downstream of the East 38th Street Bridge to the property line of Southern Wood Piedmont Company. This comprised an approximately 2,600 feet reach of the Creek.

On May 18, 1998, IT Corporation completed a delineation of coal tar deposits in the Creek sediments upstream of Hamill Road Bridge. The reach delineated extended from 100 feet upstream of the Hamill Road Bridge to the Hamill Road Bridge itself.

3.3.2.2 PRP Investigations

In December 1995, Mead Corporation, a potentially responsible party, completed a '*Post-Removal Baseline Assessment*' of the Coke Plant area in which both soil and groundwater sampling was conducted. A total of 83 soil (i.e., 40 surface and 43 subsurface), 17 groundwater, and 1 DNAPL (i.e., dense non-aqueous phase liquids) samples were collected and analyzed for Target Compound List (TCL) volatile organic chemicals, and Target Analyte List (TAL) inorganic chemicals (i.e., metals) using EPA Contract Laboratory Program (CLP) protocols. Unfortunately, the results of this investigation were not made available to EPA until the field investigation for the EPA Fund-lead RI was already more than 50 % complete. Thus, there was much duplication of effort between Mead Corporation's field investigation and the EPA RI. However, because the data collected by Mead Corporation appeared to be valid and appropriate for a remedial investigation, this data was incorporated and was discussed in the subsequent sections of the RI along with the data collected by the EPA contractor as part of the planned Fund-lead remedial investigation.

3.4 Initial Response

On September 26, 1996, EPA issued an Action Memorandum approving the proposed non-time-critical removal action (Phase I removal action) as described in the 1996 EE/CA. After commencing the removal action in June, 1997, EPA recognized that the volume of sediments contaminated by coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and December 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of contaminated sediments in the Creek. The removal Action was completed in December, 1988.

Over the course of the eighteen months of the Phase I removal action, a total of 4,235 linear feet of Chattanooga Creek was excavated, along with three isolated tar pits located in the flood plain and adjacent to the former coke plant. The total material excavated was 25,350 cubic yards, of which 22,934 cubic yards came from the excavation of Chattanooga Creek. Figure 2 depicts the location of the Phase I removal action for Chattanooga Creek.

3.5 Basis for Taking Action

As stated in Section 3.3.2, in 1993, the ATSDR issued a Public Health Advisory for Chattanooga Creek. The Health Advisory concluded that the "the presence of the coal tar in and around the creek poses a health and safety hazard.". Characterization of soils and sediments in Chattanooga Creek revealed the presence of numerous contaminants. Risk evaluation of the contaminants estimated the total current excess carcinogenic risk from direct exposure to Site soils to be as high as 2E-04. Sediment was also found to present elevated risk. The COCs contributing most to this risk level were benzo(a)pyrene and other PAHs in sediment. This risk level indicates that if no clean-up action was taken, an individual visiting the site could have an increased probability of 2 in 10,000 of developing a detectable cancer within a lifetime as a result of site-related exposure to COCs based upon reasonable maximum exposures (RMEs). It should be noted that risk associated with exposure to non-carcinogenic contaminants was deemed acceptable. Table 2 presents the estimated carcinogenic risk posed by the principal Site COCs through several possible exposure scenarios.

Table 2: Risk Characterization Summary

Table 2
Risk Characterization Summary - Carcinogens (RME Scenario)

Scenario Timeframe: Current
Receptor Population: On-Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Excess Carcinogenic Risk Ingestion	Inhalation	Dermal	Exposure Route Total
Soil	Soil (and Soil Dust)	Northeast Tributary Area - On-Site Worker Scenario	Alpha-BHC	3E-06	8E-10	2E-06	5E-06
			Arsenic	7E-06	2E-08	1E-06	8E-06
			Benzo(a)anthracene	1E-04	3E-08	8E-05	2E-04
			Benzo(b &/or k) fluoranthene	2E-04	6E-08	2E-04	4E-04
			Benzo(a)pyrene	1E-06	3E-07	1E-03	1E-03
			Carbazole	3E-07	---	3E-07	6E-07
			Chromium	---	1E-07	---	1E-07
			Chrysene	1E-06	3E-10	8E-07	2E-06
			4,4-DDE	8E-07	---	6E-07	1E-06
			Dibenzo(a,h)anthracene	1E-04	3E-08	1E-04	2E-04
			Dieldrin	2E-07	6E-11	1E-07	3E-07
			Indeno(1,2,3-cd)pyrene	6E-05	2E-08	5E-05	1E-04
			Column Total	2E-03	6E-07	1E-03	2E-03
On-Site Worker Current Excess Carcinogenic Risk Subtotal =							2E-03
On-Site Worker Current Excess Carcinogenic Risk Total =							2E-03

Table 2
Risk Characterization Summary - Carcinogens (RME Scenario)

Scenario Timeframe : Current
Receptor Population : Site Visitor
Receptor Age : Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Excess Carcinogenic Risk Ingestion	Inhalation	Dermal	Exposure RouteTotal
Soil	Soil	Northeast Tributary Area - Site Visitor Scenario	Alpha-BHC	2E-07	3E-11	3E-07	5E-07
			Arsenic	3E-07	7E-10	2E-07	5E-07
			Benzo(a)anthracene	6E-06	4E-09	1E-05	2E-05
			Benzo(b &/or k) fluoranthene	1E-05	2E-09	2E-05	3E-05
			Benzo(a)pyrene	2E-05	1E-08	1E-04	1E-04
			Carbazole	2E-08	---	3E-08	3E-08
			Chrysene	6E-08	8E-10	1E-07	2E-07
			4,4-DDE	5E-08	---	8E-08	1E-07

			Dibenzo(a,h)anthracene	7E-06	9E-10	1E-05	2E-05
			Diedrin	1E-08	2E-12	2E-06	2E-06
			Indeno(1,2,3-cd)pyrene	4E-06	5E-10	6E-06	1E-05
			Column Totals	1E-04	2E-08	2E-04	2E-04
Site Visitor Current Excess Carcinogenic Risk Subtotal =							2E-04
Site Visitor Current Excess Carcinogenic Risk Total =							2E-04

Table 2
Risk Characterization Summary - Carcinogens (RME Scenario)

Scenario Timeframe : Current
Receptor Population : Resident
Receptor Age : Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Excess Carcinogenic Risk: Ingestion	Inhalation	Dermal	Exposure Route Total
Sediment	Sediment	Chattanooga Creek - Middle Reach - Resident Scenario (Adult)	Alpha-BHC	5E-06	---	9E-06	1E-05
			Arsenic	2E-07	---	1E-07	3E-07
			Benzene	3E-10	---	3E-10	6E-10
			Benzo(a)anthracene	2E-05	NA	4E-05	6E-05
			Benzo(b &/or k) fluoranthene	3E-05	NA	5E-05	8E-05
			Benzo(a)pyrene	2E-04	NA	3E-04	5E-04
			Beryllium	7E-08	---	3E-08	1E-07
			Carbazole	3E-07	---	5E-07	8E-07
			Carbon Tetrachloride	2E-09	---	2E-09	4E-09
			Chrysene	2E-07	NA	3E-07	5E-07
			4,4-DDT(p,p-DDT)	2E-08	---	3E-08	5E-08
			Dibenzo(a,h)anthracene	1E-05	NA	2E-05	3E-05
			Dieldrin	2E-06	---	3E-06	5E-06
Sediment (cont'd)	Sediment (cont'd)	Chattanooga Creek - Middle Reach Resident Scenario (Adult) (cont'd)	Gamma-Chlordane	4E-08	---	8E-08	1E-07
			Hexachlorobenzene	2E-07	---	4E-07	6E-07
			Indeno(1,2,3-cd)pyrene	1E-05	NA	2E-05	3E-05
			PCB-1248	1E-06	---	2E-06	3E-06
			PCB-1260	4E-07	---	7E-07	1E-06
			2,3,7,8-TCDD TEQ	3E-07	---	6E-07	9E-07
			Column Totals	3E-04	---	5E-04	7E-04
Resident Current Excess Carcinogenic Risk Subtotal =							7E-04
Resident Current Excess Carcinogenic Risk Total =							7E-04

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the

Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(f)(5)(i) of the NCP. The nine criteria include:

1. Overall Protectiveness of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

The Site, as defined in the September 30, 2002 ROD, is the bed and banks of Chattanooga Creek, and comprises only one OU. Although there are areas of the Chattanooga Creek flood plain that were also addressed under the TPS remedial action, these areas were not broken out into separate OU's, but instead were addressed as part of the same OU and remedy selected for the TPS Site.

The RAO's, as specified in the ROD were:

- Minimize direct contact by the public and workers with soil and sediments containing excessive levels of Chemicals of Concern (COCs).

- Minimize direct contact by the public and workers with surface water containing excessive levels of COCs.

- Minimize direct contact by the public and workers with groundwater containing excessive levels of COCs.

- Minimize transport of contaminated soil and sediment by erosion to water courses, including the Tennessee River.

- Minimize potential for leaching of COCs to groundwater from areas of high concentration.

In order to accomplish the RAO's specified above, a remedy was chosen that consisted of a combination of the following: excavation, stabilization, treatment, recycling, offsite disposal and stream restoration. During the first phase of removal (1997-1998), emphasis was placed on waste to fuel recycling of the excavated and stabilized sediments. Due to changing economic conditions and associated cost constraints, the second phase of remedial work (2005-2007) opted for chemical stabilization and offsite disposal of the excavated sediments in lieu of recycling, as specified in the August 3, 2004 Explanation of Significant Difference (ESD). In situations where excavation was not practicable, the sediments were covered in place and physically stabilized. There were no Institutional Controls (IC's) specified in the remedy, and there are none in place. The focus of the remedy consisted of removal of contaminants, as presented in the following excerpt from the ROD:

> *A general description of the Selected Remedy is presented in this section. The details of the design for the Selected Remedy will be set forth in the EPA-approved Remedial Design during*

the Remedial Design and Remedial Action (RD/RA) phases of the Site response. The Selected Remedy focuses on the Middle Reach of Chattanooga Creek and an area of the bank of the Northeast Tributary where old contaminated dredging spoils are mounded.

- *Chattanooga Creek Sediments -*
  - *The Middle Reach of the Creek has numerous areas of coal tar-contaminated sediments (i.e., sediment bars) which will be re-identified, excavated, and processed to consolidate coal tar residues which will then be transported to an EPA-approved off-site facility for waste-to-fuel recycling. The remediation of the Middle Reach of the Creek and the bank of the Northeast Tributary (an area of mounded dredging spoils about 10 feet by 100 feet in area) will be conducted in a manner similar to the approach used to conduct the 1997-98 non-time-critical removal of the sediments in the Upper Reach of the Creek in 1997-98. Unlike many contaminants, coal tar derivatives are remarkably visible in sediments. Hence, in the 1997-98 non-time-critical removal, visual determination of the extent of PAH contamination was used. The same technique for identification will be used for the Middle Reach cleanup. However, if certain excavated sediments appear to be uncontaminated, then those sediments shall be subjected to sampling and analyses for the PAHs on the Target Compound List (TCL). The action levels for sediment removal will reflect EPA's excess lifetime carcinogenic risk range of 1×10^{-6} to 1×10^{-4} (See Table G - 9.).*

- *Northeast Tributary Area (mounded dredging spoils) –*
  - *The previously identified area of mounded dredging spoils (an estimated 444 cubic yards), along the bank of the Northeast Tributary, will be excavated, removed, and consolidated with excavated Creek sediments for off-site waste-to-fuel recycling. The dredging spoils will be excavated using visual identification of the grossly contaminated sediments and soils. Once the spoils piles are removed, confirmatory sampling and analyses of soils for the PAHs on the Target Compound List (TCL) will be undertaken to determine whether additional excavation and removal of soils will occur. The action levels for soil removal upon confirmatory sampling and analysis will reflect EPA's excess lifetime carcinogenic risk range of 1×10^{-6} to 1×10^{-4} (See Table G - 9.). Once all affected soils are removed, the excavated area will be filled with clean fill and seeded to promote the growth of local natural foliage.*

Although not specified directly in the ROD, in situations during the Phase I remedial action where it was not practicable to remove all contaminants (i.e. old meanders and certain portions of creek banks), preventing exposure to any residual contaminants was conducted via Engineering Controls (EC's), which consisted of geotextile fabric, soil and rip rap covers. It should also be noted that the above excerpt does not reflect the modification to disposal specified in the ESD. The ESD allowed disposal of stabilized sediments at a local municipal landfill rather than at a waste-to-fuel facility.

4.2 Remedy Implementation

On September 26, 1996, EPA issued an Action Memorandum approving the proposed non-time-critical removal action (Phase I removal action) as described in the 1996 EE/CA. After commencing the removal action in June, 1997, EPA recognized that the volume of sediments contaminated by coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and December 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of contaminated sediments in the Creek. The removal Action was completed in December, 1988.

Over the course of the eighteen months of the Phase I removal action, EPA's contractor, IT Corporation, excavated a total of 4,235 linear feet of Chattanooga Creek, along with three isolated tar pits located in the flood plain and adjacent to the former coke plant. The Phase I remedial action began at the Hamill Road Bridge and ended approximately 1,350 feet downstream of the East 38th Street Bridge. The total material excavated was 25,350 cubic yards, of which 22,934 cubic yards came from the excavation of Chattanooga Creek. Figure 2 depicts the location of the Phase I removal action for Chattanooga Creek.

In 2003, negotiations began between EPA and Potentially Responsible Parties (PRPs) for reimbursement of costs associated with previous removals and for implementation of additional remedial actions. On May 4, 2005, a RD/RA Consent Decree was filed, which included the following PRPs: the United States General Services Administration, MW Custom Papers, LLC (MeadWestvaco Corporation); Reilly Industries, Inc. (now known as Vertellus); and Southern Wood Piedmont Company. The private PRPs formed the Chattanooga Creek Cleanup Committee, LLC (4C) to implement the remedial action selected in the 2002 ROD, as amended by the August 3, 2004 ESD. Other PRPs, including the United States General Services Administration, Velsicol, and NWI, contributed financially, but were not actively involved with the remedial action at the site.

4C's contractor, Envirocon, mobilized to the site in early September 2005 to begin the Phase II remedial action. Phase II began at1,354 feet north of the 38th Street Bridge, where it was determined Phase I ended, and extended approximately 10,250 feet to the confluence of Chattanooga Creek and Dobbs Branch, an approximate 1.9 mile reach. Remediation of a dredged spoil pile located along the Northeast Tributary was also included in the ROD and incorporated into the Phase II remedial action.

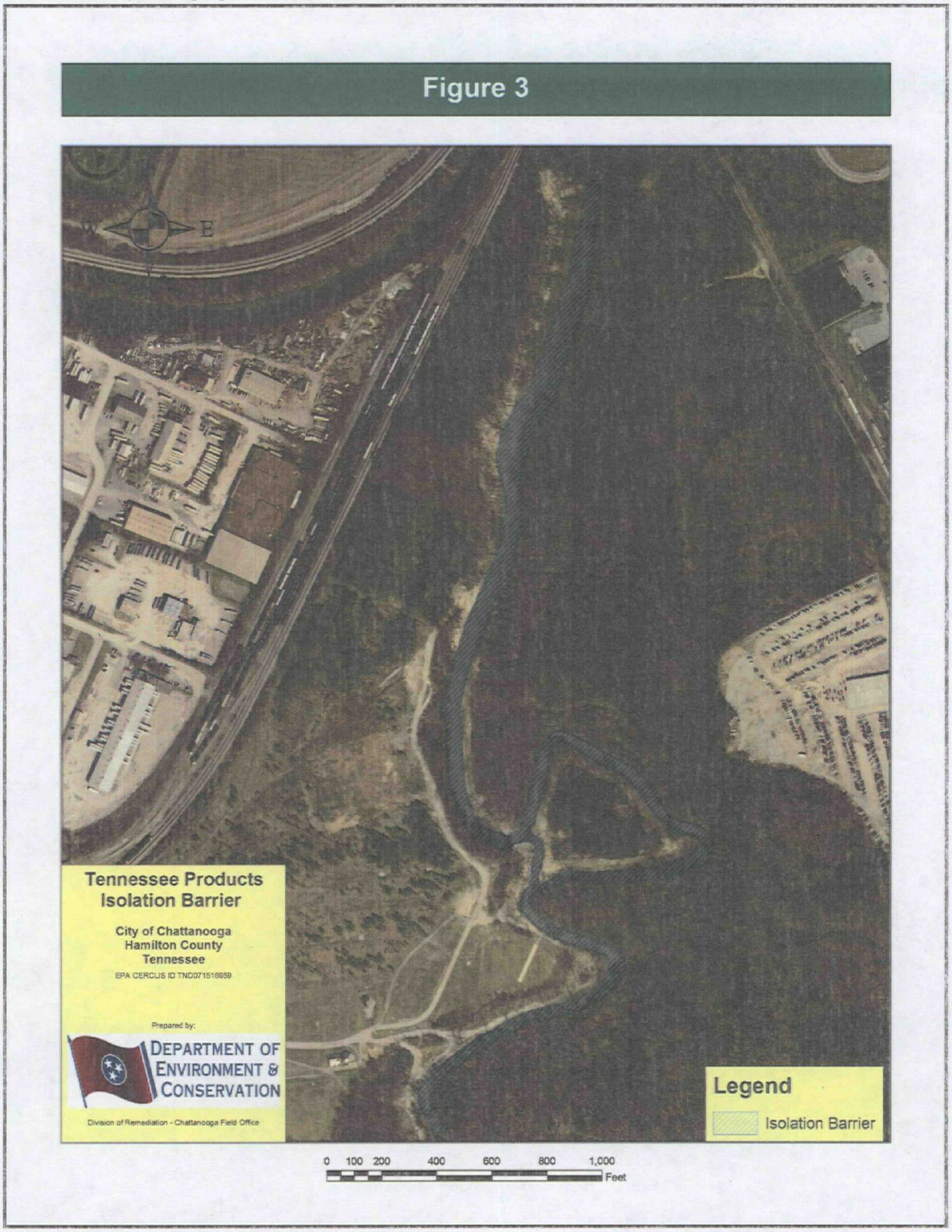
Site preparation activities were completed during September and October 2005. Excavation and stabilization of contaminated sediments began in mid-October, 2005, and was performed until work could no longer continue efficiently due to weather conditions in January 2006. Necessary equipment and personnel were remobilized in mid-April 2006 to continue sediment excavation and stabilization activities and begin restoration activities. Construction activities were performed until December 2006 when the second and final winter shutdown began. This final winter shutdown ended in April 2007. Again, necessary equipment and personnel returned to the site to complete sediment excavation and stabilization and site restoration activities. During winter shutdowns, heavy equipment was decontaminated and removed from the site and the drying bed was covered. A limited number of personnel remained onsite to maintain erosion controls, monitor water management systems, provide site security, and perform other required inspection and monitoring activities. Work was completed in September 2007, and all equipment, temporary structures, and temporary utilities were removed.

Chattanooga Creek makes an oxbow as it flows onto the property owned by Southern Wood Piedmont Company. During excavation of a portion of the oxbow in January 2006, a black liquid was observed infiltrating the bottom of the excavation. Notifications to EPA and TDEC were made of this condition. Envirocon placed 12-inches of clay in the first 250-foot section of the oxbow in an attempt to seal off the liquid. The seal did not work. Discussions and investigations by EPA SESD took place during the winter shutdown to determine an appropriate response to address the black liquid, now known to be non-aqueous phase liquid (NAPL). Based upon the EPA SESD NAPL Assessment Report released in June 2006, EPA modified the scope of work to include installation of a protective isolation barrier to mitigate recontamination concerns.

The design for the isolation barrier included the use of AquaBlok®, which is a patented solid aggregate that is coated with a clay polymer that expands when hydrated. As the AquaBlok® materials hydrate and coalesce, the mass transforms into a cohesive, low permeability barrier. For the isolation barrier, a minimum 12-inch prepared subgrade soil layer was placed over the creek bed and banks to a level that was a minimum of three feet above the highest point of observed NAPL intrusion. The creek banks were graded or maintained at a maximum 2:1 slope. In addition, holes created by previous excavations were filled to create a generally smooth surface, thus creating a longitudinal cross section of the creek that is gently undulating without any abrupt changes in grade.

Ultimately, 5,750 linear feet of isolation barrier was placed in the creek channel, beginning approximately 4,500 feet downstream of the 38th Street Bridge, where the NAPL first became evident along property owned by Southern Wood Piedmont. Placement of the isolation barrier continued uninterrupted, due to the presence of NAPL, until the termination of the Phase II remedial action at the confluence of Dobbs Branch, approximately 10,250 feet downstream of the 38th Street Bridge. Figure 3 depicts the approximate extent of the AquaBlok® isolation barrier.

Figure 3: AquaBlok® Isolation Barrier Location Map
Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding EPA's response actions at the site, and is not intended for any other purpose."



4.3 Operation and Maintenance (O&M)

The ROD does not include allowances for O&M, as the assumption at the time the ROD was prepared was that all contamination would be removed. Therefore, there are no O&M requirements or costs associated with the TPS Site at the time of this FYR.

As stated in the above section, the unanticipated occurrence of NAPL along the Southern Wood Piedmont property necessitated the placement of the isolation barrier. As long as NAPL remains present beneath the isolation barrier, periodic inspection of the isolation barrier is warranted to verify its effectiveness in preventing NAPL breakthrough to Chattanooga Creek.

EPA's Office of Research and Development (ORD) laboratory in Cincinnati, OH is involved in contaminated sediments research and was interested in the performance of the AquaBlok® isolation barrier at this site. EPA ORD issued a task order to Tetra Tech in October 2009 that employed solid phase microextration (SPME) probes to measure porewater trends in the cap layer over time. This task order provided funding and resources to monitor cap performance for three years (2009, 2010 and 2011). The majority of field work and data analysis was subcontracted to Dr. Danny Reible with the Environmental and Water Resources Engineering College at the University of Texas at Austin. Monitoring data generated by this effort is discussed in more detail in Section 6.4 and Appendices C and D (attached)

5.0 Progress Since the Last Five-Year Review

This is the first FYR for the TPS Site.

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated the FYR in October 2010, and scheduled its completion for September 2011. The EPA TPS Site review team was led by Craig Zeller of EPA, Remedial Project Manager (RPM) for the TPS Site, and also included the EPA site attorney. On October 11, 2010 EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection; and
- Five-Year Review Report development and review.

6.2 Community Notification

On November 8, 2010 a public notice was published in the *Chattanooga Times-Free Press* announcing the commencement of the Five-Year Review process for the TPS Site, providing Mr Craig Zeller's contact information, and inviting community participation. The press notice is available in Appendix B.

The Five-Year Review report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated public repository: Sallie Crenshaw Bethlehem Center at 200 West 39^{th} Street, Chattanooga, TN. Upon completion of the FYR, a public notice will be placed in the *Chattanooga Times-Free Press* to announce the availability of the final FYR report in the Site document repository.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund RAs must meet any federal standards, requirements, criteria, or limitations that are determined to be legally ARARs. Applicable or Relevant and Appropriate Requirements are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, RA, location, or other circumstance at a CERCLA site. To-Be-Considered criteria (TBCs) are nonpromulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup for protection of human health or the environment. While TBCs do not have the status of ARARs, EPA's approach to determining if a RA is protective of human health and the environment involves consideration of TBCs along with ARARs. Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemical-specific ARARs include the Maximum Contaminant Levels (MCLs) specified under the Safe Drinking Water Act (SDWA) as well as the ambient water quality criteria that are enumerated under the Clean Water Act. Because there are usually numerous contaminants of potential concern for any Site, various numerical quantity requirements can be ARARs.

There were no numeric cleanup goals specified for the sediments in Chattanooga Creek. The ROD required that visual determination of the extent of PAH contamination be utilized to determine the limits of excavation at the creek. Confirmation sampling within the limits of the creek channel excavation was not required. Standard construction methods and best professional judgment were used to remove visually contaminated sediments from the creek bed. Where visible contamination extended into the creek bank, a maximum of three feet was to be removed horizontally from the original bank and then sealed off. Field representatives from the PRPs contractor, BWSC, inspected completed stream reaches before notifying EPA that a reach was ready for inspection by EPA to verify achievement of the performance standard.

The final remedy selected for this Site in the ROD was designed to decrease the total excess lifetime carcinogenic risks, based on removal of Reasonable Maximum Exposure (RME) levels of PAHs in soil and sediments, at least two (2) orders of magnitude below the 1×10^{-6} risk level (i.e., down to 1×10^{-8}), which would meet or exceed all chemical-specific ARARs, as well as meet location- and action-specific ARARs. However, as mentioned above, confirmation sampling within the limits of the creek channel excavation was not required. Therefore, there are no chemical-specific ARARs identified in the selected remedy for sediments, surface water or groundwater within the ROD and subsequent ESD. The ROD did stipulate confirmatory sampling for soils associated with the Northeast Tributary. Risk-based chemical-specific ARARs for the Northeast Tributary are listed in Table 3.

Table 3: Remedial Goal Options for Northeast Tributary Dredging Spoils

	Carcinogenic Risk Level (Exposure Frequency = 104 days/year)		
Chemical (TEF)	**For 1E-06** (mg/kg)	**For 1E-05** (mg/kg)	**For 1E-04** (mg/kg)
Benzo[a]pyrene (1.0)	0.6	6	60
Benzo[a]anthracene (0.1)	6	60	600
Benzo[b/k]fluoranthene (0.1)	6	60	600
Chrysene (0.001)	600	6,000	60,000
Dibenz[ah]anthracene (1.0)	0.6	6	60
Indeno[123-cd]pyrene (0.1)	6	60	600

Note: All soil Remedial Goal Options values shown are mg/kg.

TEF - Toxicity Equivalence Factor- relates carcinogenic potency of other PAHs to that of Benzo[a]pyrene.

6.4 Data Review

Soil

The ROD required that confirmation sampling be conducted for the remedial action conducted at the Northeast Tributary. Two composite surface soil samples were collected and analyzed for PAHs to verify that remaining PAH concentrations were below the action level specified in the ROD. The results of the two confirmation samples demonstrated compliance with the action levels specified in the ROD.

The ROD required that sampling be performed for excavated overburden within the creek working limits that appeared to be uncontaminated and was to be placed back in the creek. The visibly clean overburden was to be segregated and tested for the PAHs on the Target Compound List (TCL). The action level for sediment removal reflects EPA's excess lifetime carcinogenic risk of 1×10^{-6} to 1×10^{-4}. These carcinogenic risk levels equate to 0.6 mg/kg to 60 mg/kg benzo(a)pyrene, respectively.

Uncontaminated sediment (overburden) was segregated and placed back in the creek at only one location during the remedial effort. Clay overburden was removed within the short-circuit portion (bypass) of the oxbow for use in construction of a dam in the oxbow area and for modified restoration within the reach. Prior to use, a representative sample of the clay was collected and analyzed for PAHs on the TCL. The results indicated that concentrations of PAHs in the clay were below the remedial goal and the material was appropriate for use at the project site.

Ground Water

Groundwater sampling was not required by the ROD. Groundwater samples were not collected during the remedial action.

Surface Water

The ROD did not specify performance requirements for water quality during implementation of the remedial action at the TPS Site. However, all reasonable efforts were taken to minimize impacts to the creek. The remedial goal was to not degrade water quality as compared to water quality upstream of the project. Treatment units were operated and water quality monitoring was conducted throughout implementation of the remedial action. As a precautionary measure, oil containment booms were in place downstream of temporary coffer dams and booms were in place throughout the construction phase at the most downstream portion of the site. Daily inspections were conducted of the booms to look for evidence of sheens or other signs that may indicate treatment was not successful. During the initial shutdown in early 2006, daily inspections were also made at the oxbow to look for the presence of a visible sheen from the NAPL encountered prior to shutdown.

While a NPDES permit was not required for the discharge from the AquaShield™ treatment units to Chattanooga Creek, discussions were held with the TDEC Division of Water Pollution Control to determine appropriate effluent limits as guidance for discharges from the two treatment units. It was agreed by the project team that analytical results of effluent samples collected from the two units would be compared to typical NPDES effluent limits of 10 milligram per Liter (mg/L) for oil and grease, 200 mg/L for total suspended solids (TSS), and a range of 6.0 to 9.0 standard units (s.u.) for pH. These parameters would be used to evaluate the effectiveness of treatment and minimize the impacts to Chattanooga Creek. It was also agreed to collect three background samples from Chattanooga Creek upstream of the project limits for comparison to treatment unit effluent samples to ensure water quality was not degraded.

A total of forty four effluent samples, not including QC samples, were collected from the treatment unit at the creek. Analytical results for the effluent samples at the creek treatment unit were typically below the NPDES effluent limits. One sample in November 2005 and two samples collected in June 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison. One sample collected in July 2006 had an oil and grease concentration of 11 mg/L, just slightly over the 10 mg/L limit used for comparison.

A total of twenty nine effluent samples, not including QC samples, were collected from the treatment unit at the drying bed. Analytical results for the effluent samples at the drying bed treatment unit were typically below the NPDES effluent limits. Four samples (collected November 22, 2005, January 20, 2006, January 25, 2006, and February 23, 2006) had a pH of over 9 s.u. The elevated pH in November 2005 is believed to be a result of the limestone fines used during the drying bed construction entering the collection piping. Two samples collected in December 2005 and January 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison.

Sediment/Porewater

The ROD required that visual determination of the extent of PAH contamination be utilized to determine the limits of excavation at the creek. Confirmation sampling within the limits of the creek channel excavation was not required. However, EPA Office of Research and Development (ORD) has provided funding to collect samples as part of a Sediment Sorption research project, which is a large EPA ORD effort to better understand reactive caps. ORD's goal is to assess the effectiveness of the AquaBlok® (isolation barrier) in minimizing vertical and advective transport, as well as obtain a visual understanding of its resistance to erosion. EPA ORD provided funding and resources for 3 years of Solid Phase Microextraction (SPME) monitoring for AquaBlok® cap effectiveness. Data from the 2009 and 2010 monitoring events were available for this FYR and are included as Appendix C and Appendix D, respectively. SPME deployment for the 2011 monitoring event was conducted in May 2011, and results were not available for this FYR. SPME sampling locations are shown in Figure 4. Sediment grab samples were also collected as part of this effort, but the data was unavailable at the time of this review.

In general, the objective of the SPME methodology is to conduct vertical profiling of porewater concentrations in a cap layer over time. The SPME samplers consisted of polydimethylsiloxane (PDMS) fibers enclosed in perforated stainless steel tubes, approximately ¼ inch in diameter and, depending on the sampler, approximately one foot to three feet in length. The passive samplers are inserted into the creek bed and allowed to equilibrate for a minimum of 14 days. The SPME probes are then retrieved, sectioned, extracted into solvent and analyzed by EPA Method 8310 for PAHs.

The very low surface water and sediment porewater concentrations observed (e.g. in the parts per trillion range) indicates that the remedy is protective. Per Dr. Reible's data in Appendices C and D, "*The preliminary conclusions of the sampling to date is that the Chattanooga Creek remedy is effectively maintaining surface water concentrations below relevant surface water criteria. In addition, little change over the past 12 months has been noted in concentrations of PAHs in sediments or cap material suggesting that no significant migration of contaminants is occurring up through cap material.*" A more comprehensive report is anticipated from EPA ORD when work under this task order is completed.

6.5 Site Inspection

The TPS Site was inspected during the SPME sampling efforts conducted in 2009 and 2010. Inspections were conducted by Craig Zeller of EPA and Troy Keith of TDEC. Also in attendance were personnel associated with the sampling efforts. During each inspection, the Site was accessed via City of Chattanooga property at Dobbs Branch. During the 2009 inspection, personnel traveled up Chattanooga Creek in a John boat and canoe to the point where Phase II began, 1354 feet north of the 38th Street Bridge. The 2010 inspection proceeded in the same manner, but was forced to stop approximately 1,400 feet short of the beginning of Phase II due to deadfall blocking the creek.

The primary purpose of the inspections was to attempt visual verification of the integrity of the isolation barrier. Secondary objectives were to observe the extent of biological recovery and stream bank stability. There are currently no IC's emplaced as part of the TPS remedial action, nor were any required by the ROD.

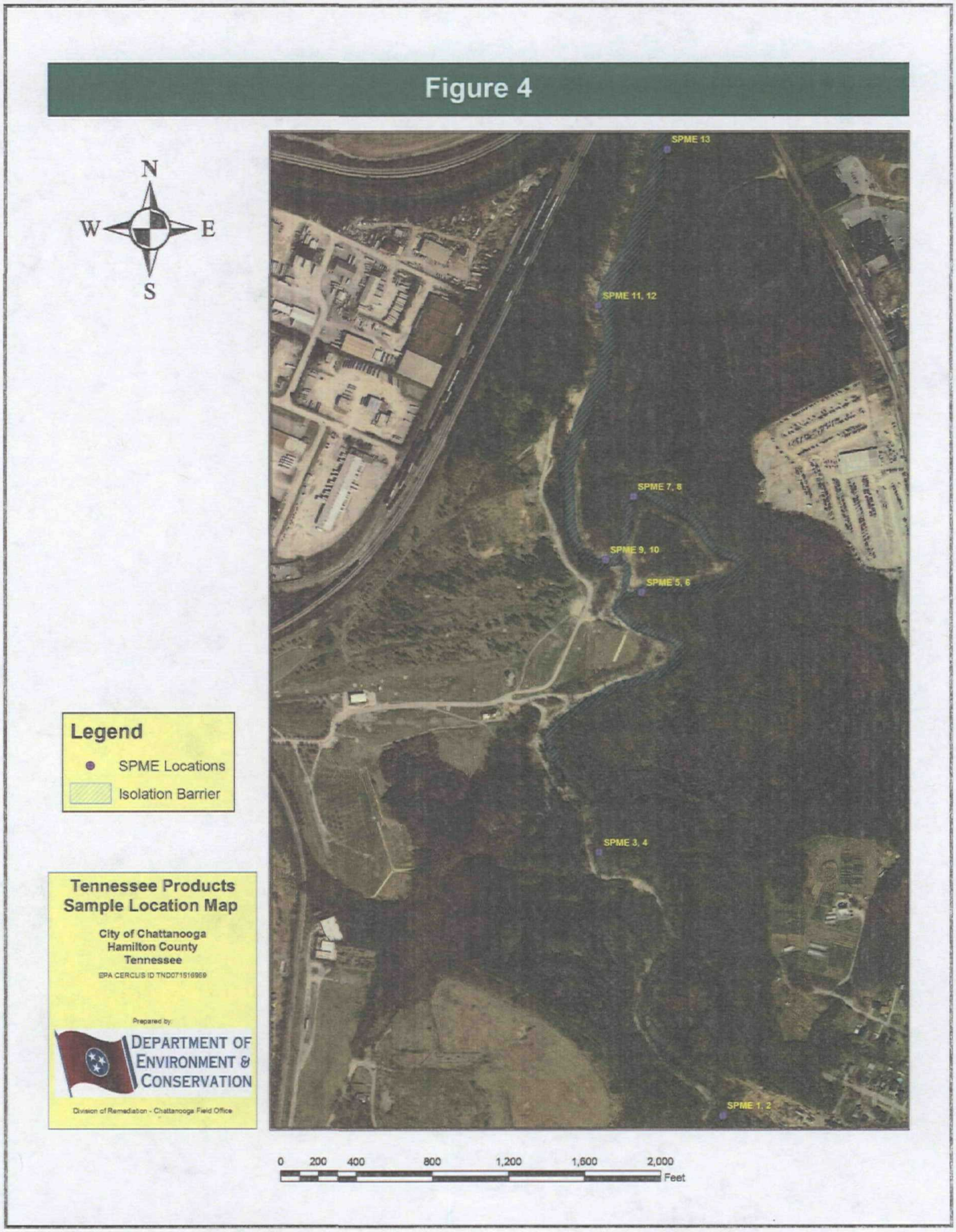
During the inspections, personnel saw no indication of stream bank or isolation barrier instability, which would be manifested in the form of erosion and partial or complete slumps of the creek bank. Fallen trees were observed in a few locations along the bank. Observations were limited to areas above the water surface and the depth that water clarity limited observations, which was approximately one foot below the water surface. The site also appeared to be well vegetated. There is not a site inspection checklist, or inspection photo log, attached in the appendix section of this FYR, as there is no infrastructure associated with this remedy to inspect or document.

6.6 Interviews

No community interviews were conducted as part of this 5-Year Review.

Figure 4: Sample Location Map

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding EPA's response actions at the site, and is not intended for any other purpose."



7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. Two years of SPME monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Porewater concentrations in the upper layers of the cap are very low (e.g. in the parts per trillion range) and do not exceed chronic surface water quality criteria. It is important to note that comparisons of porewater concentrations to surface water quality criteria is very conservative in that substantial dilution would be expected between porewater and surface water. Moreover, there is little change between the 2009 and 2010 PAH concentrations in the cap material suggesting that no significant migration of contaminants is occurring up through the AquaBlok® barrier.

7.2 Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Yes. All the exposure assumptions, toxicity data, cleanup levels, and RAOs utilized when the ROD and ESD were issued are still valid.

7.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

Yes. Site inspections conducted in 2009 and 2010 indicate a potentially significant issue with regard to deadfall (e.g. trees falling into restored creek channel). While extremely difficult to prevent, these dead trees could potentially puncture or breach the AquaBlok® protective isolation barrier. Annual inspections should continue to visually inspect the restored stream channel for any signs of sheens or NAPL migration through the cap.

7.4 Technical Assessment Summary

Conclusions from the SPME monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. Therefore, the implemented remedy at the TPS remains protective of both human health and the environment.

However, the EPA ORD task order only included annual SPME monitoring for three years in 2009, 2010, and 2011. There should be some mechanism in place for continued monitoring and regular inspections to ensure the future protectiveness of this remedy. The most appropriate mechanism is likely the TDEC RCRA Post-Closure Permit for the SWP facility, which is where the AquaBlock® installation lies.

On November 23, 2010, EPA submitted official comments to TDEC on the planned modification of SWP's Post-Closure permit. The substance of those comments was that the modified permit should require SWP to take some regular action toward ensuring that the barrier in the creek remains effective. On June 13, 201, and again on September 12, 2011, personnel from the EPA Region 4 Superfund Division met with representatives from Southern Wood Piedmont (SWP) and the TDEC RCRA Program to discuss the requirements of the TDEC RCRA Post Closure Permit for the SWP facility. EPA proposed to SWP and TDEC that future inspection and monitoring of the AquaBlok® cap performance should be included in the Final RCRA Post Closure Permit issued by TDEC. The Final permit for the SWP facility was not issued by the time this FYR was issued, so follow up with SWP representatives and the TDEC RCRA program is required to verify that inspection and monitoring were incorporated.

8.0 Issues

Table 4 summarizes the current issues for the TPS Site.

Table 4: Current Issues for the TPS Site

Issue	Affects Current Protectiveness (Yes or No)	Affects Future Protectiveness (Yes or No)
There should be some mechanism in place for continued monitoring and regular inspections to ensure future protectiveness of this remedy.	NO	YES

9.0 Recommendations and Follow-up Actions

Table 5 provides recommendations to address the current issues at the TPS Site

Table 5: Recommendations to Address Current Issues at the TPS Site

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No) Current	Future
There should be some mechanism in place for continued monitoring and regular inspections to ensure future protectiveness of this remedy.	Follow up with SWP and TDEC RCRA Program from 06/14/11 and 09/12/11 meetings to verify that inspection and monitoring of the AquaBlok® cap was incorporated into Final RCRA Post Closure Permit for the SWP Facility.	EPA	EPA	12/31/11	NO	YES

10.0 Protectiveness Statements

The remedy implemented at the Tennessee Products Site currently protects human health and the environment. Two years of SPME monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Porewater concentrations in the upper layers of the cap are very low (e.g. in the parts per trillion range) and do not exceed chronic surface water quality criteria. It is important to note that comparisons of porewater concentrations to surface water quality criteria is very conservative in that substantial dilution would be expected between porewater and surface water. Moreover, there is little change between the 2009 and 2010 PAH concentrations in the cap material suggesting that no significant migration of contaminants is occurring up through the AquaBlok® barrier. However, in order for the remedy to be protective in the long term, there needs to be a mechanism in place to ensure regular inspection and monitoring of the barrier's effectiveness. To that end, EPA has requested that TDEC include the necessary inspection and monitoring requirements to the TDEC RCRA Post-Closure Permit for the SWP facility.

11.0 Next Review

The next FYR for the Tennessee Products Site will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

Date	Document
5/1999	Final Report, Removal Action for the Tennessee Products Superfund Site
9/30/2002	Tennessee Products Superfund Site Record of Decision
11/2007	Final remedial Action Report, Tennessee Products Superfund Site
9/2008	Superfund Final Close Out Report, Tennessee Products NPL Site
2009	Memorandum from Dr. Danny D. Reible, *Report on first year sampling – Chattanooga Creek, TN* (Appendix C)
2010	Memorandum from Dr. Danny D. Reible, *Interim Report – Chattanooga Creek, TN 2010 Sampling* (Appendix D)

Appendix B: Press Notices

School

• Continued from Page A1

way to get a stand-alone [high school]," he said. "I think it's past time; a lot of students are falling through the cracks."

Tim Fowler, one of East Ridge High School's career academy instructors, helps troubleshoot a circuit built by senior Keyonte Bush during an Electrical 2 class on Tuesday.

CURRENT LANDSCAPE

CHANGING THE STIGMA

Repairs

• Continued from Page A1

TEAR DOWN TUBMAN

Housing vacancies

Name	Number of public housing units	Number of vacant units	Percent of vacant units
College Hill	497	25	5.0%
East Lake	417	28	6.7%
[illegible]	440	92	20.9%
[illegible]	153	0	0%
Wheeler	340	8	2.4%
Boynton	250	8	3.2%
Scattered	163	2	1.2%
Cromwell	200	10	5%
[illegible]	132	1	0.8%
Villages	200	5	2.5%
[illegible]	37	1	2.7%
Greenwood	98	3	3.1%
Total	2,925	186	6.4%

U. S. Environmental Protection Agency, Region 4
Announces a Five -Year Review
For the Tennessee Products Superfund Site,
Chattanooga, Hamilton County, Tennessee

The U.S. Environmental Protection Agency (EPA) is conducting a Five-Year Review of the remedy for the removal of contaminated sediments in Chattanooga Creek from the Hamill Road Bridge to Dobbs Branch, a tributary near I-24 in south Chattanooga. This Five-Year Review is associated with the Tennessee Products Superfund Site (the Site) located near the Alton Park/Piney Woods neighborhood in south Chattanooga, Hamilton County, Tennessee.

Sediments in Chattanooga Creek became contaminated with coal tar constituents and was caused, in part, by the former coal carbonization facility (coke plant) located near the area. Various companies operated the coke plant from approximately 1918 until 1987. Cleanup work in Chattanooga Creek was conducted in two phases. Phase 1 addressed contaminated sediments from Hamill Road Bridge to the 38th Street Bridge, and Phase 2 addressed contaminated sediments from the 38th Street Bridge to Dobbs Branch. In general, both phases of cleanup work involved sediment excavation, offsite disposal, and creek channel restoration. In May 2005, EPA finalized a legal settlement (Consent Decree) with parties potentially responsible for the coal tar contamination. These parties are collectively known as the Chattanooga Creek Cleanup Committee (4C). Phase 2 cleanup work was completed in September 2007 under the terms of the Consent Decree.

EPA invites community participation in the Five-Year Review process.

The EPA is beginning a Five-Year Review to monitor completed remedy and to ensure that the Site remains protective of human health and the environment. As part of the Five-Year Review process, EPA will be available to answer any questions about the Site. Community members who have questions about the Site, the Five-Year Review process, or who would like to participate in a community interview are asked to contact:

Mr. Craig Zeller
Remedial Project Manager
U.S. EPA, Region 4
61 Forsyth St. (11th Floor)
Atlanta, GA 30303-8936
Phone: 404-562-8827
zeller.craig@epa.gov

The EPA plans to complete the Five-Year Review report by December 2010. A copy of the final report will be placed in the Sallie Crenshaw Bethlehem Center at 200 West 38th Street, Chattanooga, TN for public review and information.

Appendix C:

Memorandum

Environmental and Water Resources Engineering

The University of Texas at Austin

From: Danny D. Reible Date: September 26, 2011

Bettie Margaret Smith Chair of Environmental Health Engineering

To: Sandip Chattopadhyay

Tetra Tech

Re: *Report on first year sampling – Chattanooga Creek, TN*

A total of 7 locations were sampled during the field program using a total of 13 samplers, 5 with a 60 cm sampling length and 8 with 30 cm sampling length. Sampling locations are shown in Figure 1. Samplers were deployed on 10/27/09 and retrieved on 11/10/09. One of the samples was not retrieved at that time due to high water and retrieval was delayed until 3/5/10, after water levels had returned to lower levels. Samples were sectioned and extracted in the field into prefilled acetonitrile vials and shipped back to the University of Texas. Samples were sectioned at 2-4 cm, 4-6 cm, 14-16 cm, 16-18 cm, 24-26 cm and 26-28 cm. Long samples were also sectioned at 56-58cm and 58-60 cm. Recovery of all samples was not always possible. 83 discreet samples were analyzed for PAH_{16} via SW-846 Method 8310 using fluorescence detection. Of the PAH_{16} compounds, naphthalene is expected to give inconsistent results because of the potential for loss from the PDMS fiber prior to extraction, acenaphthylene is not detectable by fluorescence detection and benzo[g,h,i]perylene and indenopyrene coelute and are not analyzed independently. 3 individual samples were lost due to HPLC errors and 11 individual samples showed some compounds (fluorine and acenaphthene) in excess of fluorescence detector saturation. Due to the sensitivity of the fluorescence detector, saturation occurs at concentrations of the order of 10 μg/L or less of these individual PAHs. To avoid this in future deployments, simultaneous UV detection will be applied.

Table 1 and Figure 2 summarize the sample concentration results. In general, concentrations in the near surface both above the cap and in the reference areas were low. Results were typically well below chronic surface water quality criteria. Region 4 chronic surface water concentration criteria are 17 μg/L for acenapthene, 39.8 μg/L for fluoranthene and 6.2 μg/L for naphthalene. Note that substantial dilution would be expected from porewater concentrations to surface water concentrations thus surface water quality criteria represent conservative criteria.

In the surface layers, concentrations at all sites (with the possible exception of sample sites 5 and 6) exhibited porewater concentrations well below surface water screening levels. The high concentrations at the surface of sample 5 were underlain by lower concentrations. The higher concentrations at the surface suggest a surface source of these contaminants or possible intermixing from depth during cap placement. Migration of contaminants through the cap would be expected to result in decreasing or constant concentrations toward the surface. Deeper into the sediment in the capped areas slightly elevated concentrations of PAHs were noted, particularly in locations 9 and 10 for fluorene and acenaphthene and 11 and 12 for HPAHs. The higher concentrations at depth in these locations will be monitored in subsequent field deployments to ensure that the contaminants due not migrate closer to the surface.

Figure 1 Sampling locations

Table 1 Description of Sampling Results

Sample	Deployment Description	Analysis Results
1	Reference site – East end of Creek Duplicate PDMS fibers on each side of 30 cm sampling tool	Average duplicate deviation 28-58% Sum of PAHs varied from 1.1-4.4μg/L HPAHs 29-43 ng/L
2	Reference site- East end of Creek Duplicate PDMS fibers in 30 cm sampling tool (collocated with 1)	Average duplicate deviation 24-36%. Sum of PAHs varied from 1.9-3.1 μg/L HPAHs 17-147 ng/L
3	Long insertion tool south of capped area	Sum of PAHs varied from 0.8-1.1 μg/L HPAHs 24-29 ng/L (3 missing samples)
4	Short insertion tool south of capped area (collocated with 3)	Sum of PAHs varied from 0.7-1.3 μg/L HPAHs 6-70 ng/L
5	Long insertion tool in capped area at southern entrance of oxbow	Fluorescence saturation of fluorene and acenaphthene, HPAHs 42-91 ng/L
6	Short insertion tool adjacent to 5	Fluorescence saturation of fluorene and acenapthene, HPAHs 66-132 ng/L
7	Long insertion tool in capped area within oxbow	Sum of PAHs <3.2 μg/L in upper 28 cm, 11.7-15.2 μg/L in 57-59 cm HPAHs 13-65 ng/L in upper 28 cm HPAHs 96-146 ng/L 57-59 cm
8	Short insertion tool adjacent to 7	Sum of PAHs <1.1 μg/L in upper 28 cm HPAHs 2-16 ng/L in upper 28 cm
9	Long insertion tool just north of oxbow	Sum of PAHs 2.7 μg/L at 3 cm, 19.8 μg/L at 15 cm and fluorescence saturation of fluorine and acenaphthene at 27 and 57 cm HPAHs 14-56 ng/L
10	Short insertion tool adjacent to 9	Sum of PAHs 1.4 μg/L at 3 cm increasing to 8.8 μg/L at 27 cm

		HPAHs ng/L -60(3 cm) 144-528 (5-27 cm)
11	Long insertion tool at northern extent of capped area	Sum of PAHs 1.8-6.2 μg/L HPAHs 184-722 ng/L
12	Short insertion tool adjacent to 11	Sum of PAHs 3.2- 9.3 μg/L HPAHs 179-436 ng/L
13	Deployed close to entry point	Retrieved April 2010

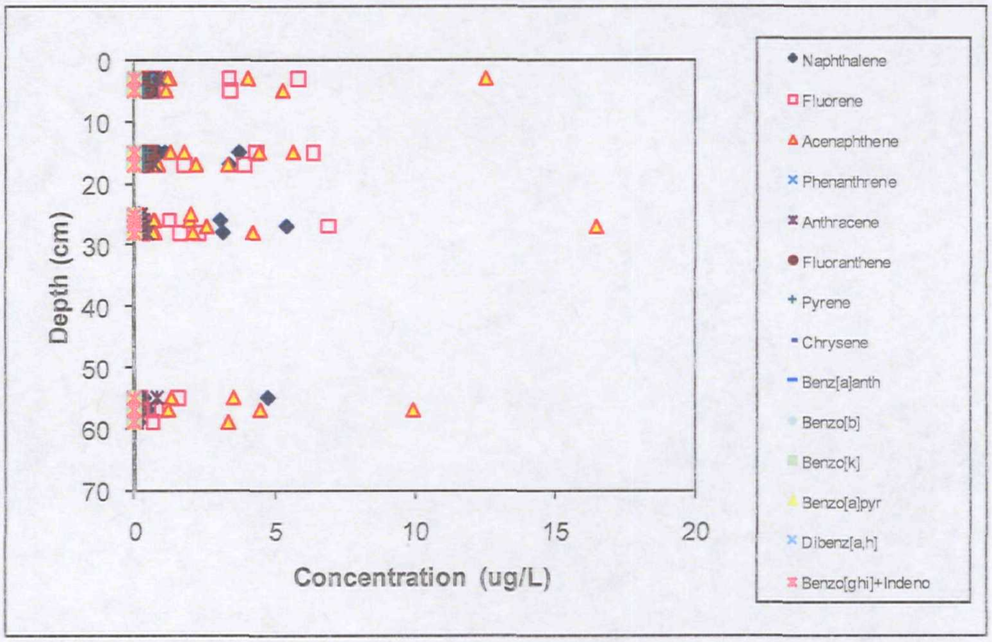


Figure 2 - Summary of all collected concentration data. Measurements above approximately 5 μg/L are estimated

The highest concentrations noted in Figure 2 are associated with the compound acenaphthene. Deep insertion tool concentration measurements of acenaphthene are shown in Figure 3. Site 5 showed high concentrations at the surface. The lower concentrations below suggest that this high concentration may be associated with near surface contamination, e.g. runoff from nearby locations or intermixing during placement, rather than migration from below. The highest acenaphthene concentrations were associated with sampling site 9 but were associated with deep samples (approximately 1 foot below the surface).

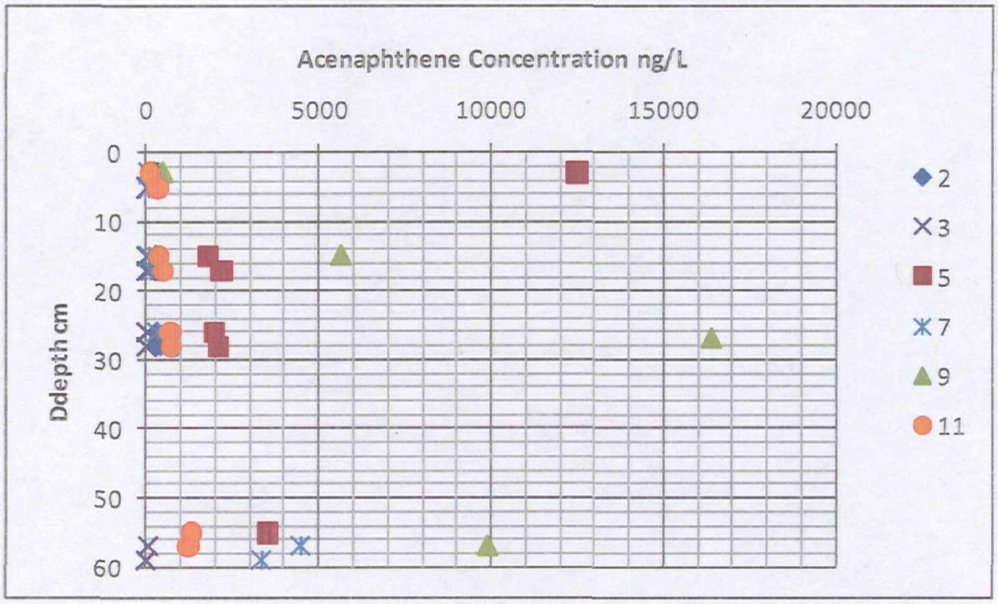


Figure 3 Acenaphthene concentrations at selected sampling locations. Concentrations above approximately 5 μg/L (5000 ng/L) are approximate

As shown in Figure 4, similar behavior was noted for fluorene. Elevated surface concentrations at location 5 and elevated concentrations at depth at location 9.

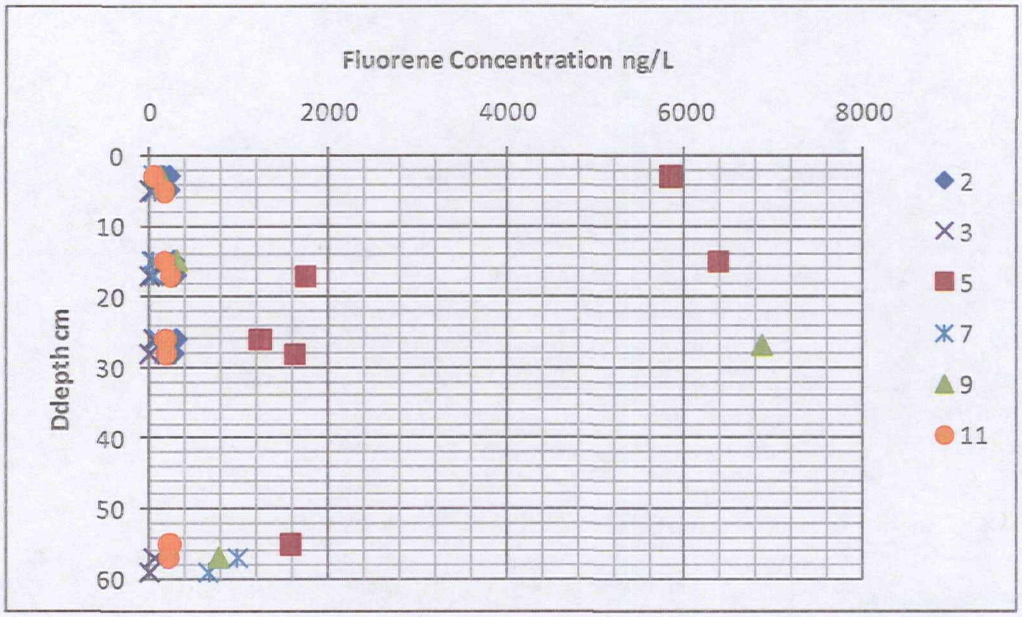


Figure 4 Fluorene concentrations at selected sampling locations. Measurements above approximately 5000 ng/L (5 μg/L) are estimated.

HPAH concentrations were substantially smaller than for LPAHs. Figure 5 shows Benzo[a]pyrene concentrations at selected sampling locations. Samples were analyzed at two adjacent vertical segments of the PDMS sampler, closely approximating replicates of the individual samples.

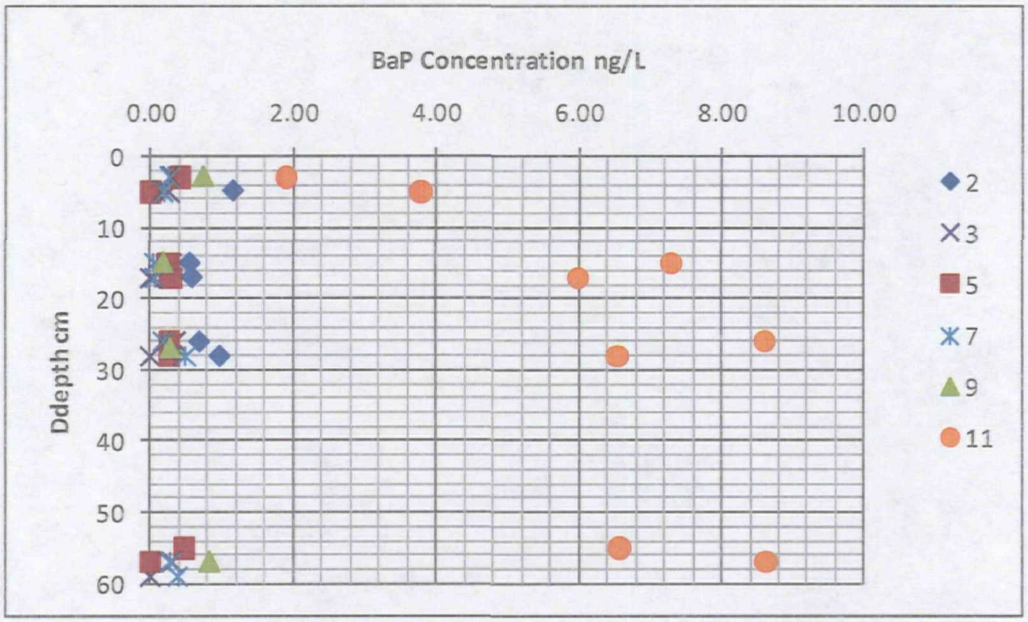


Figure 5 BaP concentrations at selected sampling locations. Two samples were analyzed in close vertical proximity at each location, indicating replicate consistency.

In samples 5, 6, 9 and 10 the elevated PAH levels were primarily associated with light PAHs (naphthalene, fluorine and acenapthene) which saturated the fluorescence detector while exhibiting concentrations of the order of 10 µg/L (estimated). In future deployments, UV detection will be used to evaluate concentrations in excess of saturation of the fluorescence detector. It should be noted that although these light PAH compounds were apparently elevated at the surface in samples 5 and 6, the heavy PAHs (pyrene and heavier) showed no significant elevation over the reference locations. At locations 11 and 12, although concentrations of light PAHs were insufficient to saturate the fluorescence detector, HPAHs were elevated, particularly at depth.

It is difficult reach definitive conclusions based upon this single sampling round. The data collected will provide a reference, however, to which subsequent sampling events can be compared.

Appendix D:

Memorandum

Environmental and Water Resources Engineering

The University of Texas at Austin

From: Danny D. Reible Date: September 26, 2011

Bettie Margaret Smith Chair of Environmental Health Engineering

To: Ed Barth, EPA, Sandip Chattopadhyay, Tetra Tech

Re: *Interim Report – Chattanooga Creek, TN 2010 sampling*

Passive sampling porewater samples were collected via solid phase microextraction (SPME) using a polydimethylsiloxane sorbent layer (PDMS) in November 2009 and November 2010 in various locations in Chattanooga Creek TN. The site has been capped to contain coal tar and creosote contaminants in a central portion of the river. 7 locations were sampled each time although the location of the most upstream sample was changed in 2010 due to debris blocking movement further upriver. Sample locations are shown in Figure 1. Details of sample location and retrieval notes are located in Appendix 1. The results of the 2009 sampling are included in a report dated Nov 15, 2010. This report is to summarize the results from the 2010 sampling and compare the results to 2009.

During 2010, 8 90 cm samplers were located at the 7 sampling locations for porewater measurement and deployed for 16 days. Samplers at locations 1,2, 3 and 4 were partially exposed to surface water (i.e. located above the cap-water interface) to measure surface water concentrations in Chattanooga Creek. In addition, 30 cm samplers were located at 4 of the locations (Location 3, 4, 6 and 7) and loaded with both a thin layer (10 μm thick PDMS on a 210 μm glass core) and a thick layer (35.5 μm PDMS on a 1 mm core) SPME fiber. The differential uptake on the two different size fibers provides an indication of the extent of equilibration achieved during the deployment. Samplers were deployed on 11/1/10 and retrieved on 11/17/10. Samples were sectioned and extracted in the field into prefilled acetonitrile vials and shipped back to the University of Texas. Samples were sectioned at 2-4 cm, 4-6 cm, 14-16 cm, 16-18 cm, 25-27 cm, 27-29 cm, 40-42 cm, 42-44 cm, 55-57 cm, 57-59 cm, 70-72 cm, 72-74 cm, 85-

87 cm and 87-89 cm. Samples were analyzed for PAH_{16} via SW-846 Method 8310 using fluorescence detection. Of the PAH_{16} compounds, naphthalene may underestimate actual concentrations because of the potential for loss from the PDMS fiber prior to extraction, acenaphthylene is not detectable by fluorescence detection and benzo[g,h,i]perylene and indenopyrene coelute and are not analyzed independently.

The measurement of porewater concentrations (C_{pw}) using the passive sampler involves measurement of the concentration in the polymer sorbent (PDMS, C_{PDMS}) and conversion to a porewater concentration assuming equilibrium defined by a PDMS-water partition coefficient, K_{PDMS}.

$$C_{pw} = \frac{C_{PDMS}}{K_{PDMS}} \qquad K_{PDMS} \square\ 0.839 Log K_{ow} + 0.117 \textit{ for PAHs} \text{ (Reible, 2010)}$$

The porewater concentrations measured in 2009 and 2010 can be compared on a relative basis for determination of any changes over time. Definition of absolute porewater concentrations, however, generally requires a correction for non-equilibration in the PDMS fibers during the 14-16 day deployment period. This non-equilibrium correction may be particularly significant due to the relatively static surface water level during the sampler deployment (i.e. no tides or rapid currents), and the low permeability and low sorptivity of the cap material. If f_{ss} represents the estimated fraction of steady state uptake in a particular deployment, the absolute porewater concentration is given by

$$C_{pw,corr} = \frac{C_{PDMS}}{K_{PDMS} f_{ss}}$$

Non equilibrium corrections are currently estimated to be effectively negligible (i.e. ~1) for low molecular weight compounds to as little as 0.2 for benzo[a]pyrene (i.e. the actual concentration is 5 times the measured proewater concentration). At the current time, the absolute concentrations (i.e. after correction for steady state) are estimated to be accurate within a factor of two for the high molecular weight compounds that require significant correction for unsteady state uptake onto the PDMS. The transient corrections are currently being investigated further to develop more accurate site specific corrections.

As indicated above, the directly measured concentrations (i.e. without correction for non-equilibrium uptake onto the PDMS on the SPME) between the 2009 and 2010 samples can be compared directly. For this purpose, the depth-averaged concentration in the upper 2 ft (i.e. <60 cm) were averaged in both the 2009 and 2010 samples at the same location. Figure 2 a-e summarizes the results. There was little difference between the two sets of samples suggesting that there has been little or no contaminant migration between 2009 and 2010. Only at location 2 (2009 samples 3 and 4) were measured PAH concentrations consistently higher in 2010 and then only by a small factor that may not be a significant change in porewater concentration. Relatively high concentrations were detected at location 3 which is the same location at which elevated concentrations were detected in 2009 (samples 5 and 6 in 2009). At site 3 there was some increase in high molecular weight PAHs (low concentrations in the figure) and a corresponding decrease in the low molecular weight PAHs (higher concentrations in the figure). At location 1 in 2010, concentrations were detected in the near surface sediments, reflecting the lack of a cap in that location and the fact that the location was not sufficiently upstream to represent an uncontaminated reference area. Location 1 in 2010 was located between the first two sampling locations employed in 2009.

Concentrations are compared to chronic surface water quality criteria as screening criteria (where available National Recommended Water Quality Criteria, EPA, 2009 for organism only (i.e. non-drinking water) exposures) (see Table 1). The comparison of pore water concentrations directly to surface water quality criteria is very conservative in that substantial dilution would be expected between porewater and surface water. In general, only surficial samples that exceed screening criteria may be of concern in that only these samples are exposed to surface waters and benthic organisms. No surface water samples exceeded surface water criteria as shown in Table 1. Note that surface water concentrations are expected to be at steady state due to the motion of the water and thus no correction for steady state is required. The very low surface water concentrations observed suggests that the remedy is effective despite somewhat higher PAH concentrations that remain in and below the sediments and cap material.

Preliminary estimates of corrections for non-equilibrium uptake onto the PDMS fibers suggested that actual concentrations of some compounds at depth within the sediments or cap material may exceed surface water criteria, primarily at sample locations 1 and 3. Location 1 is considered to be upstream of the primary area of contamination and was not capped as part of the remedy so the concentrations are relatively close to the surface. Exceedances of surface water criteria were limited to selected high molecular weight PAH compounds at depths beginning about 15 cm below the surface. At location 3, which is capped, the exceedances were also by selected high molecular weight PAH compounds, generally at depths of 50 cm or more below the cap-water interface. Figure 3 a-c shows pyrene (a mid-range PAH which depicts the observed behavior of all mid range and lighter PAHs), benzo(a)anthracene (which exhibited the highest concentrations relative to its surface water criteria) and benzo(a)pyrene (a more typical high molecular weight PAH). These concentrations are best estimates of absolute concentration (i.e. the concentrations are corrected for nonequilibrium in the PDMS fiber). Note that corrections for non-equilibrium uptake are preliminary and additional efforts will be undertaken during May 2011 to assess contaminant uptake dynamics in the creek sediments and cap material.

The preliminary conclusions of the sampling to-date is that the Chattanooga Creek remedy is effectively maintaining surface water concentrations below relevant surface water criteria. In addition, little change over the past 12 months has been noted in concentrations of PAHs in sediments or cap material suggesting that no significant migration of contaminants is occurring up through cap material. The elevated near surface concentrations at location 1 may require further investigation and may not be associated with the contaminants from the vicinity of the cap given its upstream location. Concentrations within the cap or sediments and corrected for nonequilibrium uptake into the PDMS fibers should be used with caution until the corrections are confirmed by further sampling. Note that uncertainty associated with non-equilibrium uptake applies only to sediment or cap porewater concentrations and not to concentrations measured in the surface water, which are expected to equilibrate rapidly due to water motion.

Reference – Reible, D.D. (2010) SPME/PDMS Calibration Study, Final Report to Northwest Division Seattle District US Army Corps of Engineers, April 2010.

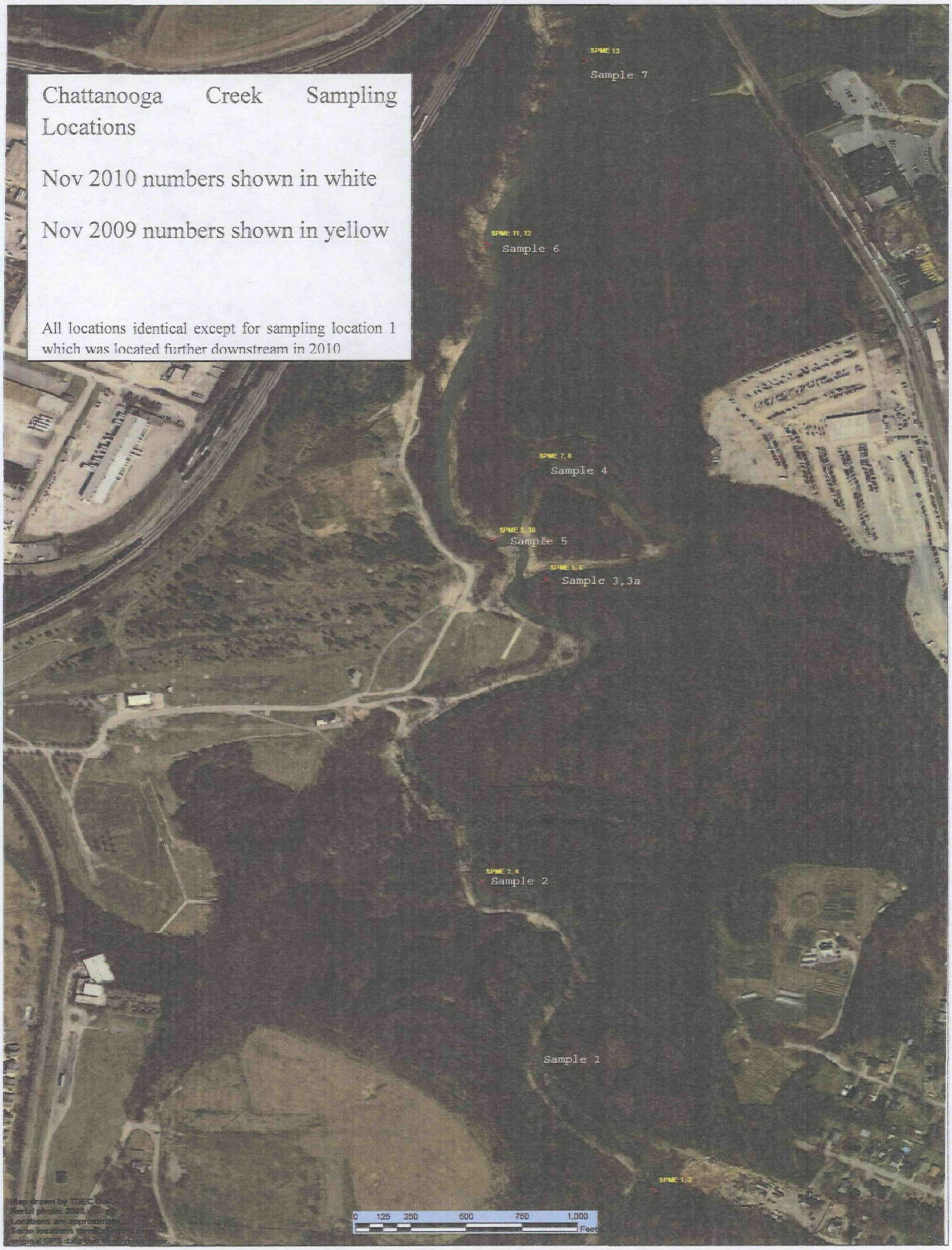
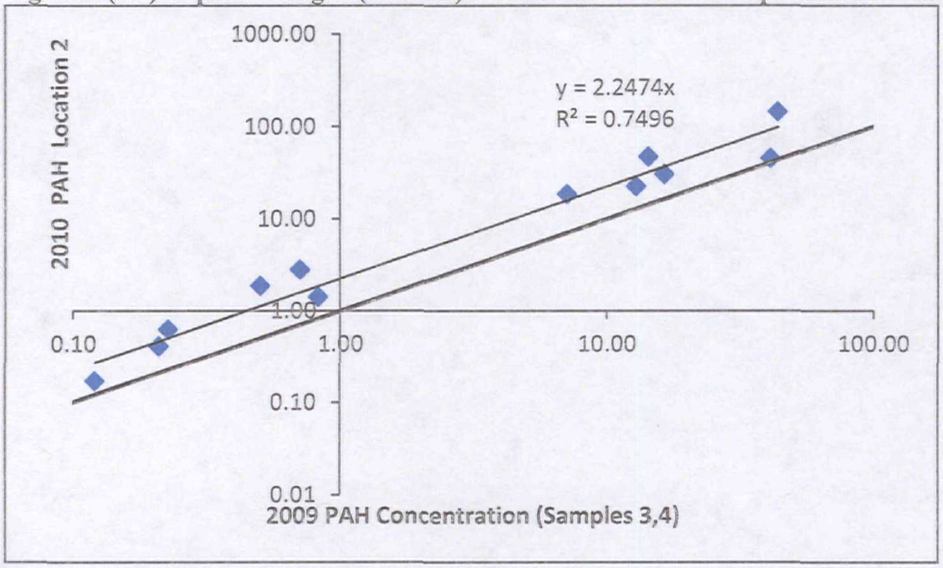
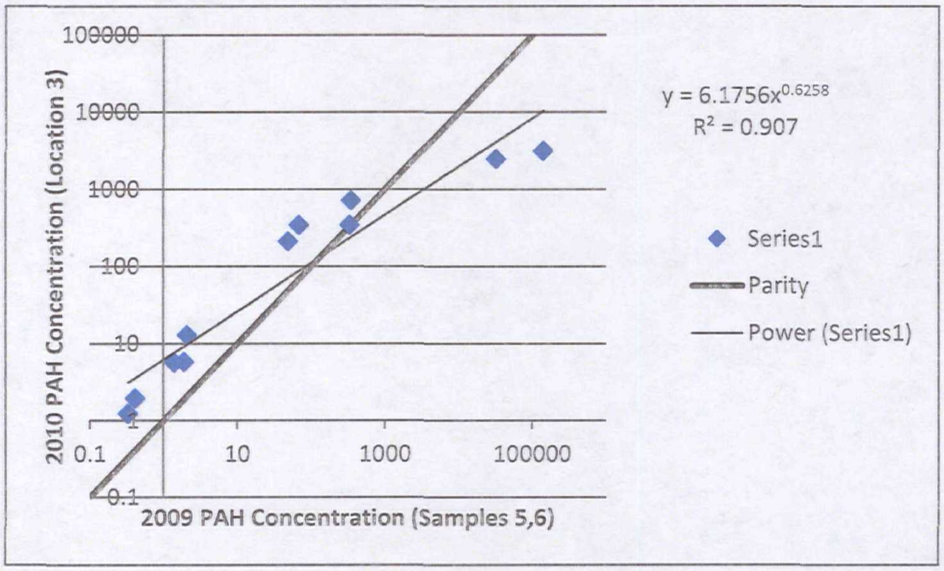
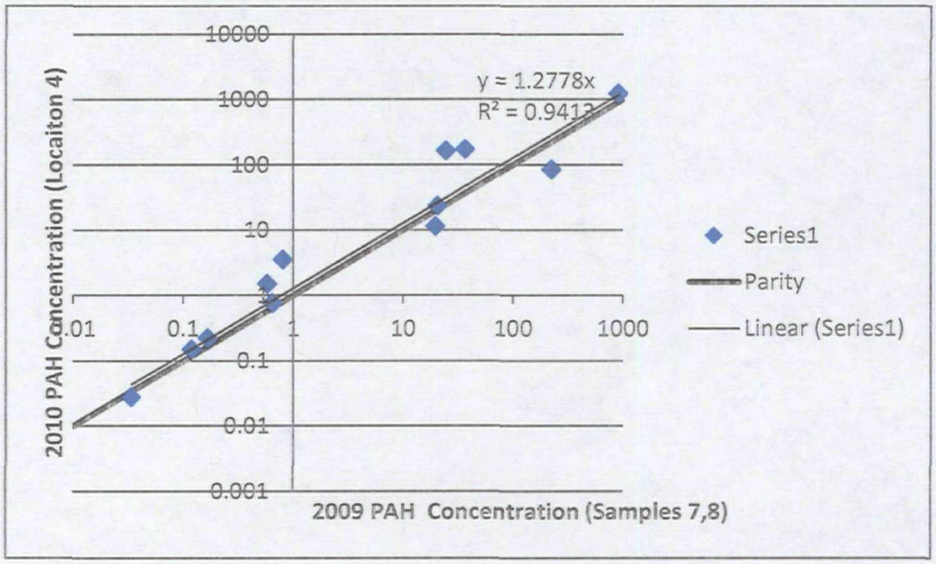


Figure 6 Sampling locations

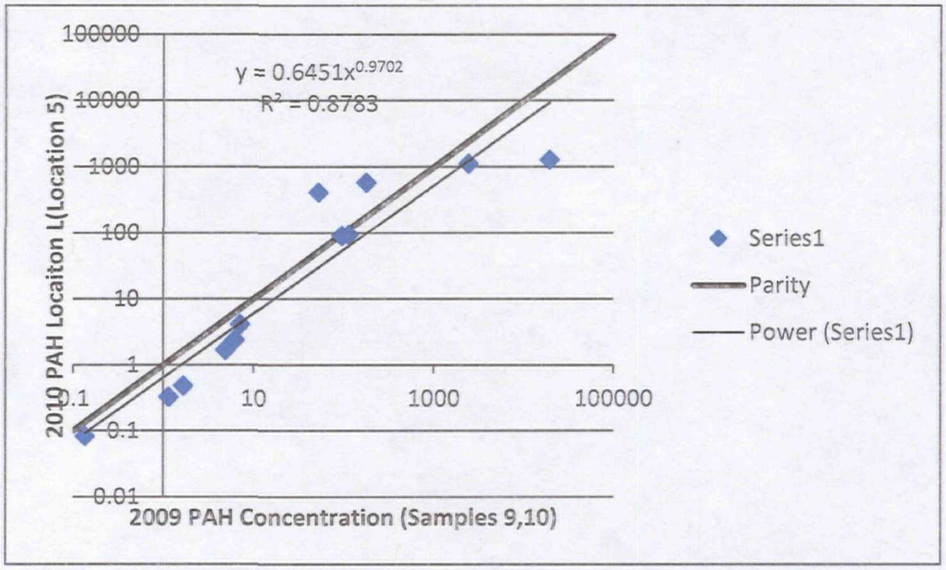
Figure 7 (a-e) Depth Averaged (0-60 cm) PAH Concentration Comparison between 2009 and 2010







10000
1000
100
10
1
0.1
0.01
0.001
0.01
0.1
1
10
100
1000
y = 1.2778x
R^2 = 0.9413
Series1
Parity
Linear (Series1)
2010 PAH Concentration (Locaiton 4)
2009 PAH Concentration (Samples 7,8)


y = 0.6451x^0.9702
R² = 0.8783
2010 PAH Locaiton L(Location 5)
2009 PAH Concentration (Samples 9,10)
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10000
1000
100
10
1
0.1
0.01
0.1
10
1000
100000
Series1
Parity
Power (Series1)

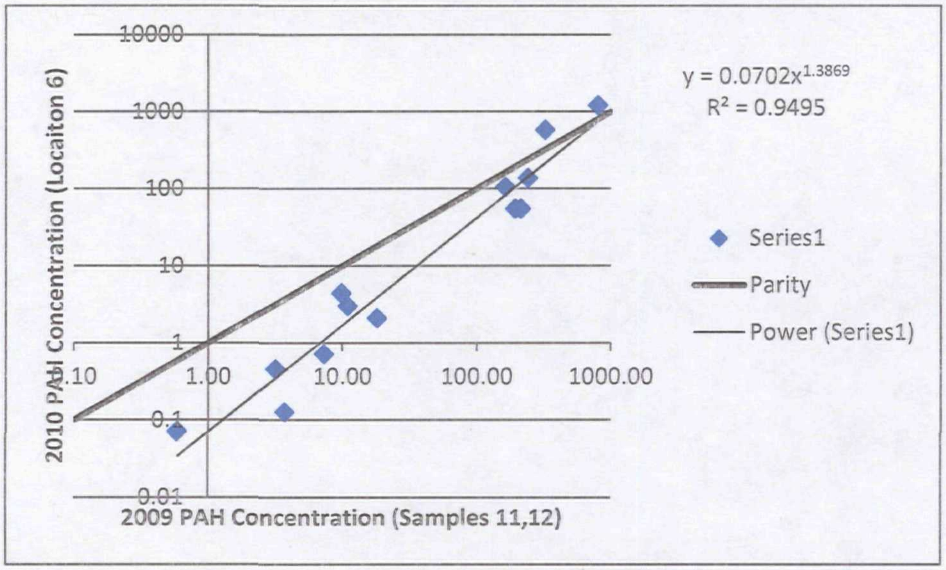

y = 0.0702x^1.3869
R² = 0.9495
2010 PAH Concentration (Locaiton 6)
2009 PAH Concentration (Samples 11,12)
10000
1000
100
10
1
0.1
0.01
0.10
1.00
10.00
100.00
1000.00
Series1
Parity
Power (Series1)

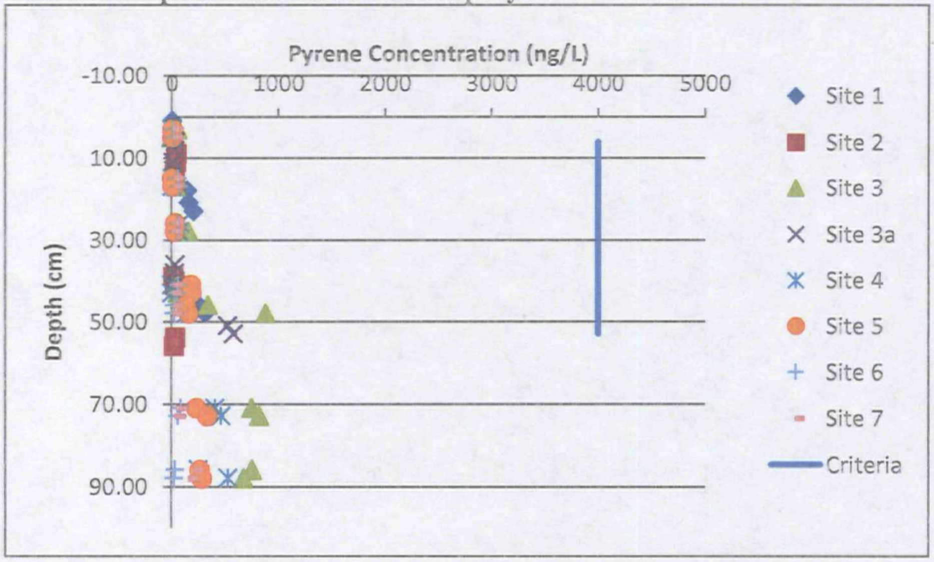
Table 1 – Maximum Surface Water Concentration and Surface Water Screening Criteria (ng/L)

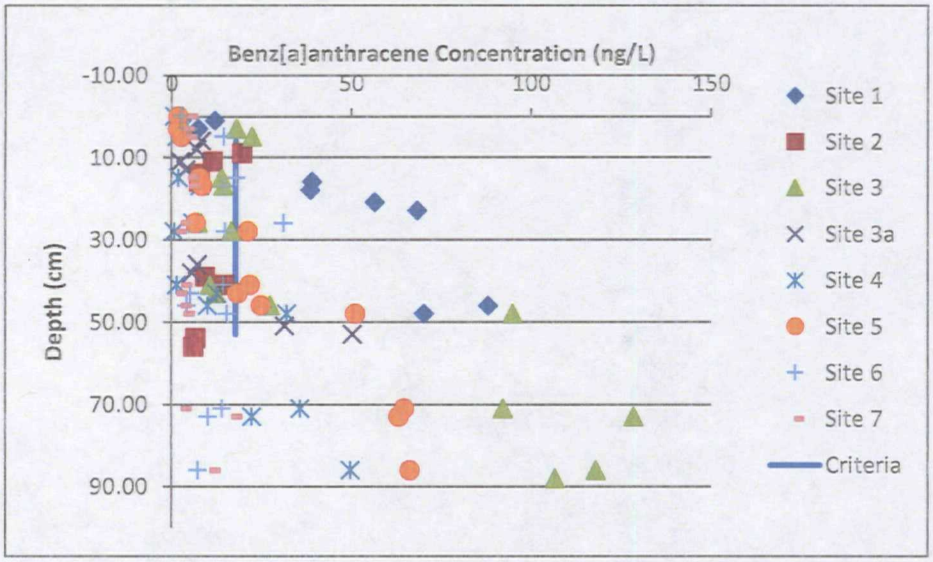
Compound	Maximum Surface Water Concentration 2011 ng/L	NRWQC, EPA 2007[1] organism ng/L	Other Criteria and source If NRWQC unavailable, lowest level found, ng/L
Acenaphthene	67	990000	
Acenaphthylene			306900 Final Chronic Value (EPA/600/R-02/016)
Anthracene	16	40000000	
Benz[a]anthracene	2.0	18	
Benzo[a]pyrene	0.4	18	
Benzo[b]fluoranthene	1.1	18	
Benzo[g,h,i]perylene	0.1[2]		439.1 Final Chronic Value
Benzo[k]fluoranthene	0.3	18	
Chrysene	4.2	18	
Dibenz[a,h]anthracene	0.05	18	
Fluoranthene	30	140000	
Fluorene	162	5300000	
Indeno[1,2,3-cd]pyrene	0.1[2]	18	
Naphthalene	25		12000 Tier II Secondary Chronic Value
Phenanthrene	54		3600 EPA Region 5 Ecological Screening Level
Pyrene	18	4000	

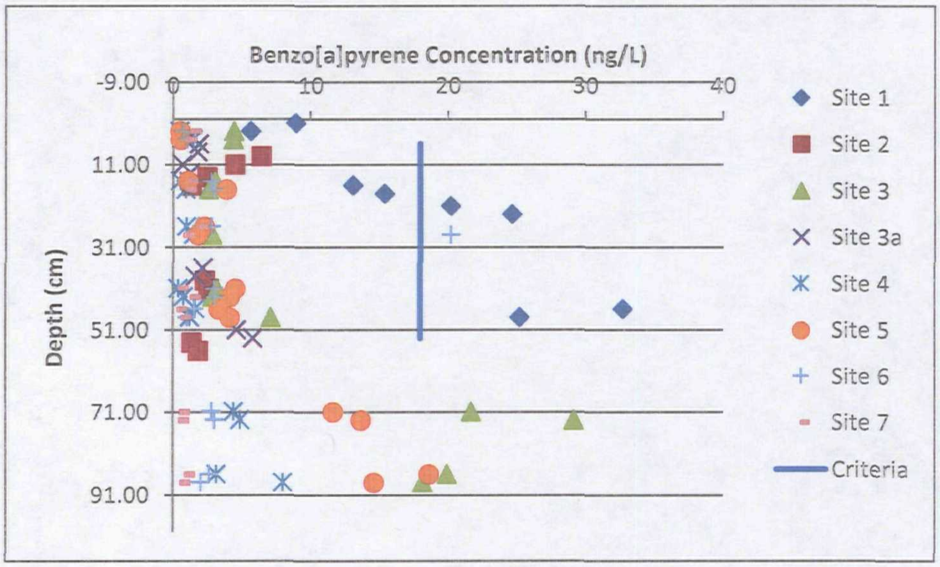
[1] National Recommended Water Quality Criteria, EPA-822-H-04-001, May 2005 http://water.epa.gov/scitech/swguidance/waterquality/standards/current/index.cfm

[2] benzoperylene and indenopyrene coelute and reported as the sum of the two

Figure 8 Observed concentration profiles of three PAHs at all sampling locations in 2010. Distance is depth into the sediment or cap layer.






Benzo[a]pyrene Concentration (ng/L)
0
10
20
30
40
-9.00
11.00
31.00
51.00
71.00
91.00
Depth (cm)
Site 1
Site 2
Site 3
Site 3a
Site 4
Site 5
Site 6
Site 7
Criteria

Appendix 1 Details concerning Chattanooga Creek Retrieval
Retrieval Date: November 17, 2010

SAMPLING PLAN FOR 90 cm WORKING LENGTH SAMPLER

If unexposed to water:

Sample ID	Depth (cm)
(Site #)-1A	2-4
(Site #)-1B	4-6
(Site #)-2A	14-16
(Site #)-2B	16-18
(Site #)-3A	25-27
(Site #)-3B	27-29
(Site #)-4A	40-42
(Site #)-4B	42-44
(Site #)-5A	55-57
(Site#)-5B	57-59
(Site #)-6A	70-72
(Site #)-6B	72-74
(Site #)-7A	85-87
(Site #)-7B	87-89

if exposed to water – the depths are shifted accordingly

SAMPLING PLAN FOR 30cm WORKING LENGTH SAMPLERS

Samplers were loaded with a thick fiber and doubly loaded with thin fiber.

Each thin fiber was divided into 2-8cm segments. Each 8 cm segment was then divided into 4 2cm segments. The 4-2cm segments were then put into one vial. Two vials per thin fiber.

Each thick fiber was divided into 4-2 cm segments. The depths 5-7cm, 7-9cm, 20-22cm, 22 24cm were sampled for each fiber.

Site 1: GPS Location N 35.00936, W 85.30357

Sampler with 90 cm working length, exposed to ~25 cm of water
No modifications to sampling plan (outlined above)

Site 2: GPS Loacation N 35.01181, W 85.30453 (Samples 3 & 4 [2009])

Sampler with 90 cm working length, exposed to ~32 cm of water
Sampler was bent and fiber broken
Modifications to sampling plan (outlined above)

COMMUNITY INVOLVEMENT PLAN

TENNESSEE PRODUCTS SUPERFUND SITE
CHATTANOOGA, TENNESSEE

FEBRUARY 2019

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV

Approved by: Abena Moore **Date:** 2-11-19

11116207

THE U. S. ENVIRONMENTAL PROTECTION AGENCY'S (EPA)

SUPERFUND COMMUNITY INVOLVEMENT PROGRAM IS COMMITTED

TO PROMOTING COMMUNICATION BETWEEN CITIZENS AND THE AGENCY.

ACTIVE PUBLIC INVOLVEMENT IS CRUCIAL TO THE SUCCESS OF ANY PUBLIC PROJECT.

EPA'S COMMUNITY INVOLVEMENT ACTIVITIES AT THE

TENNESSEE PRODUCTS SUPERFUND SITE

ARE DESIGNED TO

INFORM THE PUBLIC OF THE NATURE OF THE ENVIRONMENTAL ISSUES ASSOCIATED WITH THE SITE,

INVOLVE THE PUBLIC IN THE DECISION-MAKING PROCESS THAT WILL AFFECT THEM,

INVOLVE THE PUBLIC IN THE RESPONSES UNDER CONSIDERATION TO REMEDY THESE ISSUES, AND

INFORM THE PUBLIC OF THE PROGRESS BEING MADE TO IMPLEMENT THE REMEDY.

Table of Contents

Section 1.0
Overview of the Community Involvement Plan

The EPA developed this Community Involvement Plan (CIP) to facilitate two-way communication between the community surrounding the Tennessee Products Superfund Site (Site) and the EPA and to encourage community involvement in Site remediation activities. The EPA will utilize the community involvement activities outlined in this plan to inform area residents about the Site and provide opportunities for community involvement.

This CIP addresses the Site's relationship to the community and the EPA (Section 2.0), provides a description of the community (Section 3.0), presents the EPA's community involvement program (Section 4.0), and provides a listing of resources available (Appendices). The EPA drew upon several information sources to develop this plan, including community interviews and Site files. The EPA's Regional Office will oversee the implementation of the community involvement activities outlined in this Plan.

Section 2.0
Capsule Site Description

2.1 Site History

The Site includes an approximate 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex (formerly called Chattanooga Coke and Chemical) and adjacent industrial facilities were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of sediments in Chattanooga Creek. The Chattanooga Coke and Chemical facility operated a coal carbonization facility near the creek from 1918 to 1995, and the Reilly Tar property produced coal tar products from 1921 to 1976. The tar products were made from the by-products of coke production at the coke plant. In 1976, Velsicol purchased a parcel near Reilly Tar and Chemical.

The original facility at the Velsicol main plant site was constructed in 1948 by the Tennessee Products Corporation to expand toluene chlorination operations from the adjacent coke plant. Velsicol purchased the facility from Tennessee Products in 1963. At the time of the purchase, various chemicals were being produced at the plant.

The Southern Wood Piedmont wood treatment facility operated from 1925 until 1988. It is located in the middle course of the creek below the 38th Street Bridge. Up until 1940, wastewater from the facility was discharged directly into the creek. Later this wastewater was channeled into a wetland adjacent to the creek and ultimately into a municipal sewer line.

The coke production processes at the coke plant over its 82+ year history have led to the environmental problems in nearby areas, including Chattanooga Creek. Coal carbonization removes gases from coal by heating. This process changes coal to coke, which is used for industrial purposes. The off-gases were used for residential heating and lighting. A typical coke oven produced 80% coke, 12% coke-oven gases, 3% coal tar (containing primarily phenols, naphthalene, and other various PAHs), and 1% light oils (such as benzene, toluene, and xylene). The waste handling procedures used by the coke plant over its history are uncertain. However, uncontrolled dumping of coal tar wastes off-site was apparently a procedure used at one time as is indicated by the discovery of the Chattanooga Creek Tar Deposit and the Hamill Road Dumps. In December 1993, the EPA conducted a search for other coal tar waste deposits along the floodplain of Chattanooga Creek between 38th Street and Hooker Road Bridge, on the west side of the Creek, but no additional sites were found.

The EPA placed the Site on the Superfund program's National Priorities List (NPL) in 1995 due to contaminated groundwater, sediment, soil, and surface water resulting from operations at the facilities. To minimize risks posed by the contaminants to human health and the environment, a remedy was chosen that consisted of a combination of the following: excavation, stabilization, treatment, recycling, off-site disposal, and stream restoration. During the first phase of removal, emphasis was placed on waste-to-fuel recycling of the excavated and stabilized sediments. Due to changing economic conditions and associated cost constraints, the second phase of remedial work opted for chemical stabilization and off-site disposal of the excavated sediments instead of recycling.

2.2 Site Description/Location

The 2.5-mile section of Chattanooga Creek included in the Site is located in an urban industrial and residential area immediately west of downtown Chattanooga, Hamilton County, Tennessee, in the Chattanooga Valley.

Chattanooga Creek originates from the slopes of Lookout Mountain in Georgia, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River upstream of the Nickajack Reservoir. The creek is a gaining stream throughout its course. Many of the tributaries enter the creek in Georgia with the exception of Dobbs Branch, which enters Chattanooga Creek three miles upstream of the mouth of the creek.

The Creek falls about 1.5 feet per mile and is relatively shallow, usually not over 4 feet deep and in many places much less, on the order of 3 to 4 inches, depending on the time of year. The average depth appears to be 2 to 4 feet, except where artificially deepened. In the extremely shallow areas, a brisk current is evident, but along most of the length of the creek in Tennessee, the current is scarcely noticeable. The stream banks appear to average approximately 2 to 4 feet, except where artificially heightened. Occasional flooding occurs, as evidenced by trash entangled in trees and bushes 3 to 4 feet above the normal stream level.

The topography of the surrounding area of Chattanooga Creek is rough and mountainous, promoting a special susceptibility of the stream to overflow due too heavy, short duration, spring and summer storms. Floodplain development is considered to be heavy in the Chattanooga Creek basin. Backwater from severe Tennessee River floods could extend up the entire length of Chattanooga Creek. Headwater flooding prevails along Chattanooga Creek, but has not been a major problem. In the past, as recently as March 2003, Tennessee River backwater has caused heavy flood damage to the highly developed floodplain.

The Site is surrounded by mixed-use areas, consisting of commercial, residential, and industrial. Although most of the Site is isolated and inaccessible to residents due to being surrounded by wooded floodplain, portions of the Site may be accessed by road crossings at two locations. The only environmentally sensitive areas associated with the Site are the wetlands that occupy topographically low areas of the adjacent floodplain. Chattanooga Creek is an impaired stream as a result of upstream agricultural runoff and other man-made inputs, such as junkyards and sewer overflows.

Figure 1: Site/Community Map

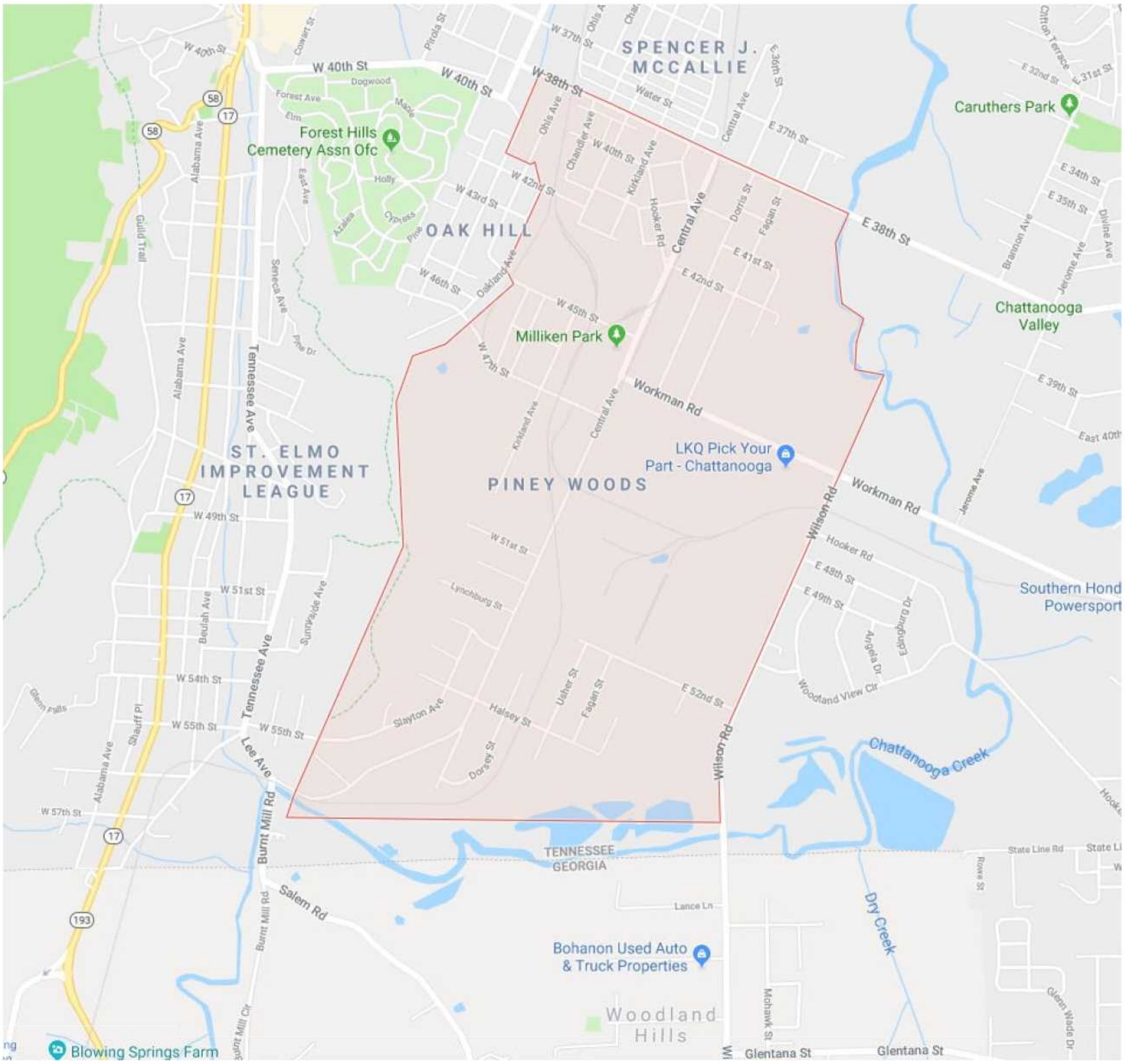


Figure 2: Regional Map

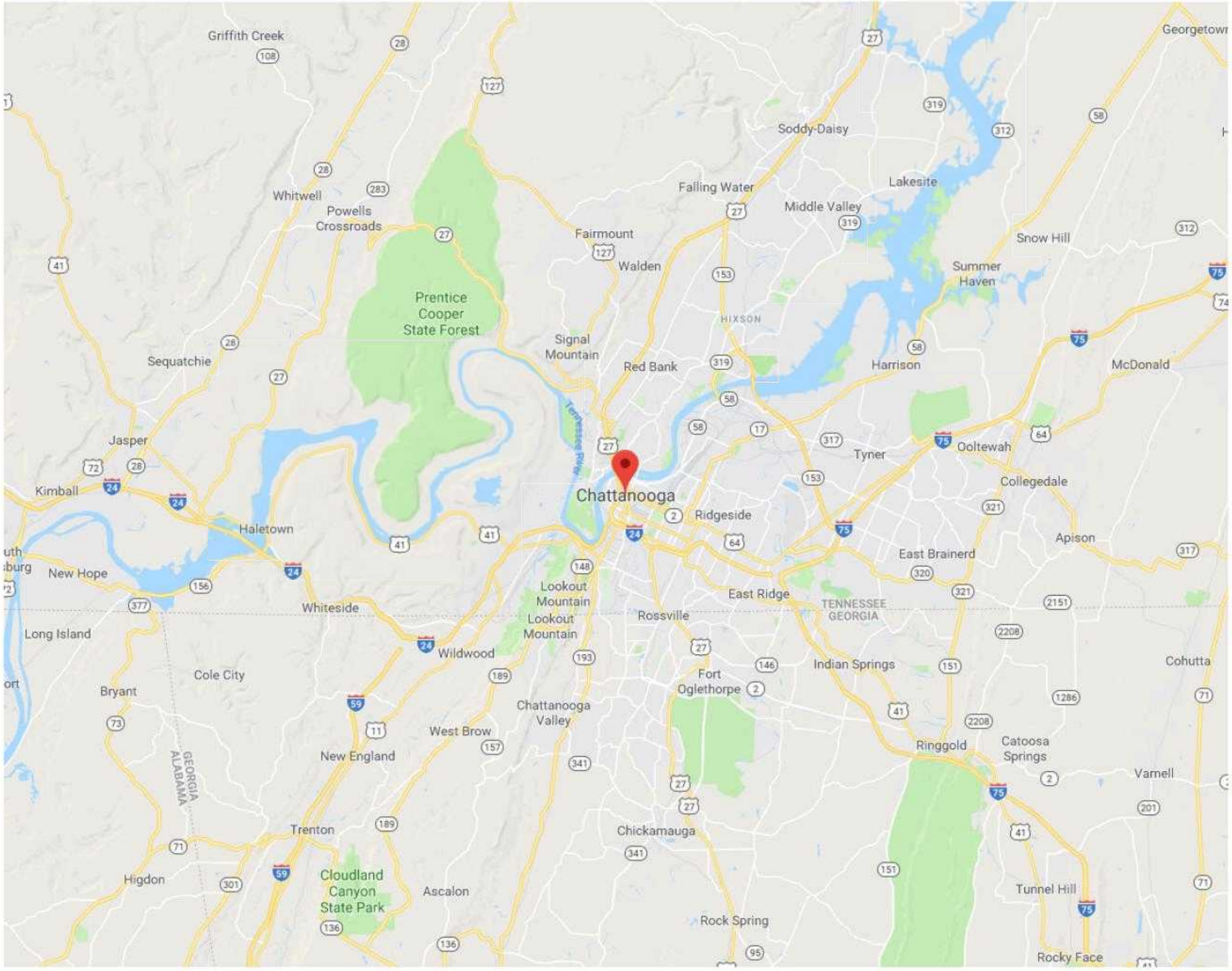


Figure 3: State Map

2.3 Site Inspections and Cleanup Activities

In 1993, the EPA fenced a section of Chattanooga Creek to prevent public access. In 1998, the EPA completed short-term cleanup activities on the upper reach of Chattanooga Creek. Cleanup activities included removing coal and tar deposits and contaminated sediments along a one-mile section of the creek between Hamill Road and 1,200 feet north of the 38th Street Bridge. The EPA removed about 25,000 cubic yards of coal, tar, and contaminated sediment from the creek. In addition, the EPA removed 1,150 cubic yards of pesticide-contaminated sediment from the creek and disposed of the sediment at a local municipal landfill.

The EPA led Site cleanup activities in 1998 in cooperation with the Tennessee Department of Environment and Conservation (TDEC). The Site's long-term remedy was selected in 2002, when the Remedial Investigation and Feasibility Study (RI/FS) was conducted, and updated in 2004. It included digging up sediments from the creek bed, removing a waste pile along the Northeast Tributary, and disposing of the material at a local municipal landfill. The remedy also included stabilizing disturbed creek banks.

From 2005 to 2007, the Site's Potentially Responsible Parties (PRPs), with oversight by the EPA and TDEC, dug up about 108,000 tons of stabilized sediment from the creek channel and transported it to an off-site landfill for disposal. The PRPs placed AquaBlok (a clay plastic-type barrier that expands when it gets wet) over 5,750 feet of the creek channel to prevent potential recontamination from the non-aqueous phase liquid (NAPL) in the subsurface of the sediment. The isolation barrier was placed beginning approximately 4,500 feet downstream of the 38th Street Bridge.

Site contamination does not currently threaten people living and working near the Site. However, a fish advisory remains in effect for fish caught from Chattanooga Creek.

The EPA conducted the first Five-Year Review (FYR) of the Site's remedy in September 2011, and the second FYR in September 2016. These reviews ensure that the remedies put in place protect public health and the environment, and function as intended by Site decision documents. A third FYR is scheduled for 2021.

Section 3.0
Community Background

3.1 Community Profile

Chattanooga is located along the Tennessee River, in Hamilton County, near the southeastern corner of the state of Tennessee. It is the fourth largest city in Tennessee and one of the two principal cities of East Tennessee, along with Knoxville. Chattanooga lies between the Appalachian Mountains and the Cumberland Plateau, on the north border of Georgia. It is 120 miles northwest of Atlanta, Georgia, 120 miles southwest of Knoxville, Tennessee, 135 miles southeast of Nashville, Tennessee, and 120 miles northeast of Huntsville, Alabama.

The local economy includes a varied mix of manufacturing and service industries, four colleges, and several preparatory schools known throughout the South. The Tennessee River flows through the middle of downtown Chattanooga's entertainment district and then continues through the high, forested walls of the river gorge. The city is served by the Chattanooga Airport and the Chattanooga Area Regional Transportation Authority. Chattanooga is home to University of Tennessee at Chattanooga and Chattanooga State Community College.

The Site is located in southwest Chattanooga, Tennessee. The South Chattanooga section of the city is heavily industrialized and densely populated. Many types of industries (including chemical, metal products, and others) are situated along Chattanooga Creek and nearby areas. Mixed in with these industries are low-income, residential neighborhoods including multi-housing units and single-family homes. Public housing, local schools, playgrounds, and community centers are also located near or immediately adjacent to these manufacturing operations.

Chattanooga, TN Demographics and information:

Population: 177,582

Chattanooga median age: 36.7 years

Tennessee median age: 38.6 years

Chattanooga estimated median household income in 2016: $41,266

Chattanooga estimated per capita income in 2016: $27,135

Race/Ethnic Background:

White: 59.9% | Black: 32.9% | Asian: 2.1% | Hispanic: 5.6% | Two or more races: 2.1% |

Education:

High school graduate or higher: 29.3%

Bachelor's degree or higher: 24.5%

Graduate degree or higher: 7.14%

EJSCREEN Report (Version 2018)
1-mile Ring Centered at 34.999238,-85.314411
TENNESSEE, EPA Region 4
Approximate Population: 5,476
Input Area (sq. miles): 3.14
Tennessee Products

Figure 4: EJ Screen Map

Selected Variables	Value	State Average	Percentile in State	EPA Region Average	Percentile in EPA Region	USA Average	Percentile in USA
Demographic Indicators							
Demographic Index	72%	32%	92	38%	90	36%	90
Minority Population	74%	25%	90	37%	83	38%	81
Low Income Population	70%	39%	92	39%	92	34%	92
Linguistically Isolated Population	0%	2%	66	3%	51	5%	44
Population with Less Than High School Education	22%	15%	77	14%	77	13%	80
Population under Age 5	7%	6%	66	6%	65	6%	62
Population over Age 64	11%	15%	35	15%	39	14%	43

3.2 History of Community Involvement

A public meeting to answer general Superfund questions was held on November 1, 1994. A public meeting for the Proposed Removal Plan for the 1997-1998 removal was held on July 16, 1996. An availability session for the removal and the RI occurred on April 24, 1997, and a public meeting for the Proposed Plan for the final Record of Decision (ROD) took place on August 22, 2002. Other public meetings were held on September 20, 2005; October 25, 2007; and September 19, 2016. Notices were placed in the Chattanooga Times Free Press announcing the public meetings and the commencement of the first FYR. The first FYR was conducted in September 2011 and the second FYR was conducted in September 2016.

In addition to keeping the residents informed, the EPA also presented information to the Chattanooga City Council on November 1, 2005.

Fact sheets regarding cleanup activities and updates were mailed to residents in 1994, 1998, and 2002, in addition to the fact sheets mailed announcing the public meetings. Community interviews were conducted in 1994, 2011, and 2016.

3.3 Key Community Concerns

During public meetings and community interviews, concerns brought up by residents included breathing problems, air quality, air pollution, foul odors, cost of cleanup, and reuse of the Site. Concerns and questions have been addressed and answered since the Site was placed on the NPL list in 1995. During the most recent community interviews in 2016, representatives of the EPA and Arcadis (PRP contractor) heard no new complaints or concerns regarding the Site.

3.4 Response to Community Concerns

The EPA continues to be available to the community on an as needed basis to answer any questions that may arise from past or future activities regarding the cleanup of Chattanooga Creek.

3.5 Summary of Communication Needs

Residents have indicated that they are aware of the Site and the Site's remediation process and are appreciative of the EPA's efforts in cleaning the area. All residents have requested to continue to receive any new information about the Site via email or mailed fact sheets. Residents noted that the *Chattanooga Times Free Press* does a good job keeping the community updated on the cleanup project.

Section 4.0
EPA's Community Involvement Program

The overall goal of the EPA's community involvement program is to promote two-way communication between citizens and the EPA and to provide opportunities for meaningful and active involvement by the community in the cleanup process. The EPA will implement the community involvement activities described below. The following plan is based on the results of the community interviews described earlier. The plan addresses each issue that was identified as important to the community.

4.1 The Plan

Issue 1: Keeping the public informed and up to date.

Activity 1A: Designate an EPA Community Involvement Coordinator (CIC).

- Objective: To provide a primary liaison between the community and the EPA, and to ensure prompt, accurate, and consistent responses and information dissemination about the Site. In those instances, where the EPA's CIC may be unable to provide adequate information (such as on technical issues), inquiries will be directed to the appropriate EPA contact.
- Method: The EPA has designated an EPA CIC to handle Site inquiries and serve as a point of contact for community members. The CIC was appointed by the Region 4 Superfund Division. Abena Moore is the EPA CIC assigned to the Site. She works closely with Craig Zeller, the EPA's Remedial Project Manager (RPM) for the Site.
- Timing: The current CIC has been designated to provide community support.

Activity 1B: Prepare and distribute Site fact sheets and technical summaries.

- Objective: To provide citizens with current, accurate, easy-to-read, easy-to-understand information about the Site.
- Method: Fact sheets are mailed to all parties on the Site mailing list. In addition, copies are available at the information repository (see Appendix H) and other locations as identified by the community.
- Timing: The EPA has and will continue to prepare and distribute fact sheets to inform the community on an as needed basis.

Activity 1C: Provide a toll-free "800 number" for the community to contact the EPA.

- Objective: To enable citizens to obtain the latest information available whenever they want, rather than having to wait for a meeting or a fact sheet, and without incurring any cost.

- Method: The EPA has activated the 800 number and publishes the number periodically in the local papers and in all fact sheets.

- Timing: The toll-free number is currently operational (1-877-718-3752).

Activity 1D: Maintain a mailing list for the Site.

- Objective: To facilitate the distribution of site-specific information to everyone who needs or wants to be kept informed about the Site.

- Method: The EPA has created a mailing list that includes all residences adjacent to the Site, in known or suspected paths of migration, or those otherwise affected by the Site. The EPA will also solicit interested parties via fact sheets, newspaper articles, public meetings, public availabilities, etc.

- Timing: The EPA has developed the Site mailing list and reviews and or revises the list periodically to keep it current.

Activity 1E: Maintain the Information Repository.

- Objective: To provide a convenient location for residents to review and copy official documents and other pertinent information about the Site and EPA activities.

- Method: The repository is a reference collection of Site information containing the Administrative Record file, other site-specific information, the CIP, resource information and the general Superfund process. The CIC will work with a local contact to establish the local repository. This repository will be accessible to the physically challenged, will have copier facilities, and will be available to residents during normal business hours and at least some evening and or weekend hours.

- Timing: The EPA established the Information Repository at the Sallie Crenshaw Bethlehem Community Center, 200 West 38th Street, Chattanooga, TN 37410. The EPA will continue to provide additional documents as they become available.

Activity 1F: Provide Site information on the Internet.

- Objective: To provide key resources for searching and listing both general and specific information about hazardous waste issues.

- Method: A Site Status Summary for this Site and information about the EPA can be found at https://www.epa.gov/superfund/Tennessee-Products
  - EPA Headquarters: http://www.epa.gov
  - EPA Region 4: https://www.epa.gov/aboutepa/about-epa-region-4-southeast
  - EPA Region 4: 61 Forsyth Street SW, Atlanta, GA 30303

- Timing: Site status summaries are periodically updated.

Activity 1G: Provide Technical Assistance Grant (TAG) information.

- Objective: To provide resources for community groups to hire technical advisors to assist them in interpreting technical information about the Site.

- Method: The EPA will provide information about the TAG to affected communities. The EPA will provide qualified group(s) TAG applications and assistance in completing the application.

- Timing: The EPA will provide options for technical assistance resources throughout the Superfund process.

Activity 1H: Maintain the Administrative Record.

- Objective: To provide residents with a paper trail of all documents, resources, etc. used by the RPM and Site Team to make decisions about the Site and its cleanup.

- Method: The EPA has provided two sets of the Administrative Record for the Site: one in the EPA Region 4 offices located at 61 Forsyth Street SW, Atlanta, GA 30303, and one located in the local Information Repository near the Site.

- Timing: The Administrative Record is opened as soon as Site investigation begins and remains open until the last ROD is signed.

Issue 2: Provide adequate and meaningful opportunities for community involvement.

Activity 2A: Hold public meetings.

- Objective: To update the community on Site developments and address community questions, concerns, ideas, and comments.
- Method: Refer to Appendix G for suggested meeting locations. The EPA will continue to schedule, prepare for, and attend all announced meetings. The EPA will provide at least two weeks prior notice of the scheduled meeting. The RPM, CIC, and other appropriate EPA staff will attend.
- Timing: The EPA holds public meetings as appropriate.

Activity 2B: Encourage formation of a Community Advisory Group (CAG).

- Objective: To assist citizens with a meaningful way to become actively involved in the Site cleanup process, and to provide the Site Team with a viable means of learning citizen concerns and attitudes.
- Method: The EPA may provide information about the formation of a CAG. If formed, the EPA may provide administrative support but will not be an active member.
- Timing: The EPA will respond to any requests for assistance to form a CAG, if Stakeholder interests show support. Information will be provided as needed.

Activity 2C: Make informal visits to the community.

- Objective: To help keep community members informed about the Site, while providing the EPA with feedback about Site activities and the community's opinions.
- Method: The EPA has established a presence in the community through informal, often unscheduled visits to talk spontaneously with local residents.
- Timing: Throughout the entire cleanup process.

Activity 2D: Solicit comments during a Public Comment Period.

- Objective: To give community members an opportunity to review and comment on various EPA documents. This provides the citizens with meaningful involvement in the process and also provides the Site Team with valuable information for use in making decisions.
- Method: The EPA will announce each comment period separately. Announcements will appear in local newspapers and EPA fact sheets; they will include particulars on duration, how to make comments, where to submit comments, etc. The EPA may solicit comments

on the following information draft documents: draft CIP, draft summary of test results (not individual tests) and initial interpretation, preliminary findings on the RI and a list of possible remedies likely to be considered, preliminary findings of the FS and a brief summary of the leading contender for the proposed remedy, and preliminary plans for implementation and construction.

- Timing: Comment periods will be announced as appropriate.

Activity 2E: Prepare and issue a Responsiveness Summary.

- Objective: To summarize comments received during comment periods, to document how the EPA has considered those comments during the decision-making process, and to provide responses to major comments.

- Method: The EPA will prepare a Responsiveness Summary as a section of the ROD. The Responsiveness Summary will include four sections: 1. Overview; 2. Background on Community Involvement; 3. Summary of comments received and EPA responses; 4. Remedial Design Remedial Action concerns. All information, both technical and nontechnical, will be conveyed in a manner that is easily understood.

- Timing: The EPA issues the Responsiveness Summary as part of the ROD.

Activity 2F: Revise the Community Involvement Plan (CIP).

- Objective: To identify and address community needs, issues, or concerns regarding the Site or the cleanup remedy that are not currently addressed in this CIP.

- Method: The Revised CIP will update the information presented in the previous version of the CIP.

- Timing: The EPA revises the CIP as community concern warrants or at least every three years until the Site is closed out.

4.2 Time Frame Summary for Community Involvement Activities

ACTIVITY	TIME FRAME
Designate an EPA Community Involvement Coordinator (CIC)	**Designated; Abena Moore**
Prepare and distribute Site fact sheets and technical summaries	**As needed**
Provide a toll-free "800 number" for the community to contact the EPA	**Currently in operation**
Maintain a mailing list for the Site	**Ongoing**
Maintain the Information Repository	**Update as needed**
Provide Site information on the Internet	**Currently available; update as needed**
Provide Technical Assistance Grant (TAG) information	**Ongoing**
Maintain the Administrative Record	**Update as needed**
Hold public meetings	**As needed**
Encourage formation of a Community Advisory Group (CAG)	**Ongoing**
Make informal visits to the community	**As needed**
Solicit comments during a Public Comment Period	**As needed and required**
Prepare and issue a Responsiveness Summary	**Following public comment periods**
Revise the Community Involvement Plan (CIP)	**As needed, at least every 3 years**

Appendix A
EPA Regional Contacts

Craig Zeller
Remedial Project Manager
U.S. EPA, Region 4
61 Forsyth Street SW
Atlanta, GA 30303
(404) 562-8827
zeller.craig@epa.gov

Abena Moore
Community Involvement Coordinator
U.S. EPA, Region 4
61 Forsyth Street SW
Atlanta, GA 30303
(404) 562-8834
moore.abena@epa.gov

Appendix B
Local Officials

Mayor
Andy Berke
101 East 11th Street
Chattanooga, TN 37402
(423) 643-7800
mayor@chattanooga.gov

City Council Members
Chip Henderson – District 1
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7186
cchenderson@chattanooga.gov

Jerry Mitchell – District 2
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7187
jmitchell@chattanooga.gov

Ken Smith – District 3
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7188
kensmith@chattanooga.gov

Darrin Ledford – District 4
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7184
dledford@chattanooga.gov

Russell Gilbert – District 5
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7183
rgilbert@chattanooga.gov

Dr. Carol Berz – District 6
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7181
cberz@chattanooga.gov

Erskine Oglesby, Jr. – District 7
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7180
eoglesbyjr@chattanooga.gov

Anthony Byrd – District 8
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7182
abyrd@chattanooga.gov

Demetrus Coonrod – District 9
1000 Lindsay Street
Chattanooga, TN 37402
(423) 643-7185
dcoonrod@chattanooga.gov

City Clerk
Nicole Gwyn
1000 Lindsay Street, Ste. 102
Chattanooga, TN 37402
(423) 643-7170
CouncilClerk@chattanooga.gov

Appendix C
State Officials

State Governor
Bill Lee
State Capitol, 1st Floor
600 Dr. Martin L. King, Jr. Blvd.
Nashville, TN 37243
(615) 741-2001
https://www.tn.gov/governor/contact-us.html

Lieutenant Governor
Randy McNally
700 Cordell Hull Building
425 5th Avenue North
Nashville, TN 37243
(615) 741-6806
lt.gov.randy.mcnally@capitol.tn.gov

State House of Representatives
District 28
Yusuf Hakeem
504 Kilmer Street
Chattanooga, TN 37404
(615) 741-2702
rep.yusuf.hakeem@capitol.tn.gov

State Senate
District 10
Todd Gardenhire
PO Box 4506
Chattanooga, TN 37405
(615) 741-6682
sen.todd.gardenhire@capitol.tn.gov

Appendix D
Federal Elected Officials

U.S. Senate

Lamar Alexander
Washington D.C. Office
455 Dirksen Senate Office Building
Washington, DC 20510
(202) 224-4944
https://www.alexander.senate.gov/public/index.cfm?p=Email

Chattanooga Office
Joel Solomon Federal Building
900 Georgia Avenue, #260
Chattanooga, TN 37402
(423) 752-5337

Marsha Blackburn
Washington D.C. Office
B40B Dirksen Senate Office Building
Washington, DC 20510
(202) 224-3344
http://www.blackburn.senate.gov/

Chattanooga Office
10 West M.L. King Blvd., 6th Floor
Chattanooga, TN 37402
(423) 541-2939

U.S. House of Representatives

Charles "Chuck" Fleischmann: District 3
2410 Rayburn House Office Building
Washington, DC 20515
(202) 225-3271
https://fleischmann.house.gov/contact/email

Chattanooga Office
900 Georgia Avenue
Suite 126
Chattanooga, TN 37402
(423) 756-2342

Appendix E
Potentially Responsible Parties

Southern Wood Piedmont Company
c/o Warren Snyder
Senior Manager for Environmental Projects
Rayonier Advanced Materials
1301 Riverplace Blvd., Suite 2300
Jacksonville, FL 32207
(904) 357-4619
warren.snyder@rayonieram.com

MW Custom Papers, LLC
c/o Steve Hamilton
Director of Environmental Services
WestRock Company
1000 Abernathy Road NE
Atlanta, GA 30328
(770) 326-8136
steve.hamilton@westrock.com

General Services Administration
c/o Letitia J. Grishaw, Chief
Environmental Defense Section
Environment and Natural Resources Division
U.S. Department of Justice
Post Office Box 7611
Washington, DC 20044
(202) 514-2219

Appendix F
Media Contacts

Television Stations:

WTVC
4279 Benton Drive
Chattanooga, TN 37406
(423) 756-5500
http://newschannel9.com/

WDEF
3300 Broad Street
Chattanooga, TN 37408
(423) 785-1227
https://wdef.com/

WFLI
1101 East Main Street
Chattanooga, TN 37408
(423) 265-0061
http://chattanoogacw.com/

WDSI-FOX
1101 East Main Street
Chattanooga, TN 37408
(423) 265-0061
http://foxchattanooga.com/

WRCB
900 Whitehall Road
Chattanooga, TN 37405
(423) 267-5412
http://www.wrcbtv.com/

GPB
260 14th Street NW
Atlanta, GA 30318
(800) 222-6006
http://www.gpb.org/

WTCI
7540 Bonnyshire Drive
Chattanooga, TN 37416
(423) 702-7800
http://www.wtcitv.org/

Radio Stations:

WUTC 88.1 FM: Public Radio
725 Oak Street, 104 Cadek Hall
Chattanooga, TN 37403
(423) 425-4756
http://wutc.org/

WYBK 89.7 FM: Religious
PO Box 5605
Chattanooga, TN 37406
(423) 493-4382
http://wjsu.org/

WDOD 96.5 FM: Adult Contemporary
2615 South Broad Street
Chattanooga, TN 37408
(423) 321-6200
http://www.hits96.com/

WVMG 101.1 FM: Country
US 101
7413 Old Lee Hwy
Chattanooga, TN 37421
(432) 892-3333
http://us101country.com/

WSKZ 106.5 FM: Classic Rock
821 Pineville Road
Chattanooga, TN 37405
(423) 756-6141
http://wpbqradio.com/home.html

Newspapers:

Times Free Press
400 East 11th Street
Chattanooga, TN 37403
(423) 756-6900
http://www.timesfreepress.com/

The Pulse
1305 Carter Street
Chattanooga, TN 37402
(423) 265-9494
http://www.chattanoogapulse.com

Digital Media:

The Chattanoogan
http://www.chattanoogan.com

Appendix G
Meeting Locations

Downtown Chattanooga Public Library
1001 Broad Street
Chattanooga, TN 37402
(423) 643-7700
librarycontact@lib.chattanooga.gov

South Chattanooga Branch Library
925 West 39th Street
Chattanooga, TN 37410
(423) 643-7780
southlibrary@lib.chattanooga.gov

South Chattanooga Recreation Center
1151 West 40th Street
Chattanooga, TN 37409
(423) 643-6810
http://www.chattanooga.gov/

Appendix H
Repository Location

<u>Local Repository:</u>

Sallie Crenshaw Bethlehem Community Center
200 West 38th Street
Chattanooga, TN 37410
(615) 266-1384
https://www.thebeth.org/www

Appendix I
Other Local Resources

Tennessee Department of Environment & Conservation (TDEC) – Chattanooga Field Office
1301 Riverfront Parkway, Suite 206
Chattanooga, TN 37402
(423) 634-5745
https://www.tn.gov/environment/contacts/about-field-offices/field-offices/chattanooga.html

Appendix J
Fact Sheets

August 2002

EPA SUPERFUND UPDATE
PROPOSED PLAN FACT SHEET

CLEANUP OF CHATTANOOGA CREEK

TENNESSEE PRODUCTS SUPERFUND SITE
CHATTANOOGA, HAMILTON COUNTY, TENNESSEE

REGION 4

EPA COMPLETES INVESTIGATION OF CHATTANOOGA CREEK, RECOMMENDS FINAL REMEDY FOR THE SITE

The U.S. Environmental Protection Agency (EPA), in partnership with the Tennessee Department of Environment and Conservation (TDEC), have completed the Federal Superfund investigation of Chattanooga Creek, also known as the Tennessee Products Superfund Site. The site is located in the Alton Park and Piney Woods neighborhood in south Chattanooga, Hamilton County, Tennessee. This Fact Sheet will briefly describe the results of the Remedial Investigation (RI) and Feasibility Study (including a summary of all the cleanup alternatives evaluated), and will present the proposed final decision concerning the cleanup of the site.

PUBLIC MEETING

August 22, 2002
7:00 p.m.
Calvin Donaldson Elementary School

EPA will host a public meeting on August 22, 2002 at the Calvin Donaldson Elementary School at 7:00 p.m. The meeting will provide an opportunity for the community to discuss the investigation, the cleanup alternatives considered, and the preferred remedy with EPA and State representatives. The public is encouraged to review and comment on the cleanup alternatives considered and on the proposed remedy presented in this plan. **EPA is accepting public comments from August 12 to September 10, 2002.**

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This proposed plan summarizes information that can be found in greater detail in the RI/FS report and other documents contained in the Administrative Record file for the site.

Inside you will find:

- ***Background Information***
- ***Summary of the Site Investigation***
- ***Summary of the Feasibility Study***
- ***The site's health risks***
- ***EPA's proposed cleanup remedy***
- ***Where to get more information***

Site Accomplishments

The initial cleanup of coal-tar in Chattanooga Creek was completed in November 1998 (under EPA's removal authority). The cleanup which began in June 1997, by the EPA, was the first phase of the cleanup plan for the Chattanooga Creek.

This first phase of the cleanup consisted of the following: 165 cubic yards were removed from a pit of coal-tar constituents, located just north of Hamill Road near Wilson Road; 250 cubic yards of coal-tar constituents were removed from a disposal pit located in the creek's flood plain; two waste mounds of coal-tar constituents located behind the former plant site and next to the railroad tracks (near Wilson Road) were removed -- about 2,000 cubic yards of material; and, 4,236 linear feet of Chattanooga Creek were cleaned up. A total of 25,350 cubic yards of waste was excavated from the site. The wastes were recycled at a municipal electric power plant in Baldwin, Illinois, and at a cement manufacturing plant in South Carolina. These facilities used the coal-tar constituent wastes for fuel in their processes.

Along with the contaminated sediment, all of the discarded debris found in the creek was removed. Specifically, hundreds of car and truck tires were taken out. The tires were sent to a Chattanooga facility which burned the tires for fuel. The materials which could not be recycled were sent to a local landfill. The cost of the first phase of the cleanup was approximately $12 million (actual physical cost of the cleanup).

Site Background and History

The Tennessee Products Superfund Site is located in the Alton Park/Piney Woods neighborhood in south Chattanooga, Tennessee. The Site consists of two distinct source areas of contamination:

1. Certain areas in the flood plain containing uncontrolled coal-tar constituents; and
2. Sediments along approximately 2.5 miles of Chattanooga Creek that were contaminated with coal-tar constituents.

The approximate locations of these areas are shown on Figure 1 (attached).

Contamination in the creek was caused, in part, by the former coal carbonization facility (coke plant), located at 4800 Central Avenue. This facility was operated from approximately 1918 until 1987. Various companies operated the facility throughout it's history. The Tennessee Products Corporation operated it the longest, from 1926 to 1964.

In 1994, all of the buildings on the plant property, except for the foundations and some underground tanks, were removed. However, several areas contaminated with coal-tar constituents still exist on the plant property.

The 24 acre property was once listed on the National Priorities List (NPL) for Superfund sites, as a part of the Tennessee Products Site listing. However, in 1996, the Mead Corporation, a Potentially Responsible Party (PRP) which owned the facility from 1964 to 1974, challenged EPA's decision to include the plant property on the NPL, and was successful in Federal Court of removing the plant property from the list. The plant property is now being addressed by Mead under Tennessee Department of Environment and Conservation (TDEC) oversight. The remainder of the site, which includes Chattanooga Creek, stayed on the NPL.

Waste water from the facility was routinely discharged into Chattanooga Creek through an old pipe and through a ditch that empties into the creek. EPA believes the discharges from the facility began at the start of plant operations and continued into the late 70's. The discharges were oily wastewater containing particles of coal-tar. Two other sources of contamination at the site are: a coal-tar processing plant which operated next to the former coke plant until 1976; and the chemical manufacturing plant, currently owned by Velsicol Chemical.

Throughout the 1980's and early 1990's EPA and TDEC studied and monitored the water quality in Chattanooga Creek. In the summer 1992 EPA concluded a formal study of the contaminated sediments in the Creek. The results of that study are outlined in a report titled *Chattanooga Creek Sediment Profile Study*. High levels of coal-tar contamination were detected in most of the creek's sediment.

Based on the results of the sediment study and other information known about the site, the Agency of Toxic Substances and Disease Registry (ATSDR) issued a Health Advisory for the site. They identified health hazards associated with direct contact of sediments contaminated with coal-tar. In response to this finding, ATSDR conducted health education classes about the creek at local schools; a health assessment was performed to identify potential waste exposure to the community; and many information meetings and written updates were provided to the community.

In 1993, EPA placed a fence between the creek and the Alton Park Middle School to prevent children from playing in the creek.

EPA used the ATSDR Health Advisory to place the site on the National Priorities List (NPL) in September of 1995. The Remedial Investigation and Feasibility Study began shortly before the formal listing of the site.

In June 1997, EPA began removing the contaminated sediment from the most accessible section of the creek, specifically, between Hamill Road and the section of creek next to the Alton Park Middle School (north of 38th Street). This cleanup action is described in the previous Site Accomplishments section of this Fact Sheet.

The cleanup strategy established for the site was to remove the contamination in the creek which presented the highest risk to the community first, then remove the rest of the contamination through a longer-term cleanup action. As mentioned before, the first phase of the cleanup was accomplished by the 1997-1998 removal described earlier. The second phase of the cleanup will remove all of the contaminated sediment remaining from those areas of the creek which are less accessible, and which present a lesser exposure risk to the community. The second phase of the cleanup strategy is the subject of this Fact Sheet and proposed plan.

Remedial Investigation and Feasibility Study

The purpose of a remedial investigation is to determine the nature and extent of contamination at the site and determine the threat to public health and the environment from a release or potential release of hazardous substances from the site. The remedial investigation included reviewing historical information, and collecting samples from the air, water, soil, sediment and waste. The remedial investigation focused on the plant site, although a number of samples were collected from areas surrounding the creek and the plant site. EPA decided not to collect many creek sediment samples for this investigation because EPA conducted a more comprehensive study of the creek in 1992 (*Chattanooga Creek Sediment Profile Study*).

The purpose of the Feasibility Study was to determine the best cleanup remedy. For this site, EPA conducted a Feasibility Study focused on cleanup alternatives for the creek sediment only, since this is the largest waste area requiring remediation. Other much smaller areas in the flood plain that are contaminated with coal-tar and its related chemicals will be addressed along with the creek sediments.

The former plant property was not considered in the development of the cleanup strategy because the property was removed from the NPL listing by the Federal Courts. Therefore, no remedy will be proposed for the plant property as part of this remedy selection process. However, it will be addressed through the State Superfund authority, and the State is currently coordinating a cleanup with the Mead Corporation.

Site Characteristics and Study Results

Chattanooga Creek is located in the Tennessee River Basin, and occupies the northern portion of the Chattanooga Valley between Lookout Mountain and Missionary Ridge. The creek originates from the slopes of Lookout Mountain, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River. The creek has a watershed of nearly 75 square miles, of which approximately 22% is in Tennessee.

The portion of the creek that is known to contain coal-tar contaminated sediment is a segment 2.5 miles long, beginning from approximately Hamill Road and ending at Dobbs Branch (see Figure 1, attached).

Soil, sediment, groundwater and air samples were collected from the site and surrounding targeted areas. Some of the targeted areas included: the Coke Plant site; Chattanooga Creek tar deposit in the flood plain; Schwerman Trucking site; Chattanooga Creek sediments and groundwater; Residential areas; the Early Childhood Family Education Center playground; and the Northeast and Northwest tributary areas. Please note that the Remedial Investigation covered many areas, including areas that were cleaned up during the 1998 removal action. The focus of the proposed Phase 2 clean up are areas containing the most contamination.

A summary of the Remedial Investigation results relevant to the areas containing contamination associated with the Tennessee Products Site is presented below:

Air: Air samples were collected to find out if any contaminants from the site were in the air. A few samples showed the presence of the type of contaminants found in the creek, but the levels did not present an unacceptable risk. Also, during the first phase of the cleanup, while the contaminated creek sediments were being removed, EPA monitored the air continuously and did not detect any unsafe levels of contaminants in the air.

Groundwater: Shallow groundwater samples were collected near the creek to determine if contaminants from the creek were being released into the groundwater. Deeper groundwater samples were also collected in certain areas, but no contaminants were detected. Results show that a few of the organic chemicals found in the sediment are present in the shallow groundwater near the creek. The following chemicals were detected at very low concentrations:

Volatile Organics: Chlorobenzene
Semi-Volitile Organics: 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Naphthalene, Acenaphthalene, Phenanthrene, and 2-Methylnaphthalene
Pesticides: Alpha-BHC, Beta-BHC, Gama-BHC and Dieldrin
Metals: Iron (found to be above background concentrations)

The groundwater contamination found to be associated with the creek is limited to a narrow band along the creek. During most of the year groundwater flows into the creek, preventing the chemicals in the creek from escaping. Only during high flood events does water flow from the creek into the groundwater.

Soil: Soil samples were collected from the Northeast Tributary area and the Chattanooga Creek tar deposit located in the flood plain. Results from each area are as follows:

Northeast Tributary Area: soil samples collected from the banks of the Northeast Tributary contained some Volatile Organic compounds (benzene, toluene, ethylbenzene and xylenes); high concentrations of Polynuclear Aromatic Hydrocarbons (PAHs); and low concentrations of pesticides. The PAH compounds are the type of chemicals associated with the creek and plant site. There is no apparent pattern in the distribution of the chemicals in the soil. It is believed that the soil next to the Northeast Tributary is material that was removed from the tributary channel and dumped along its bank. It has been documented that the wastewater discharged from the rear of the former coke plant flowed into the Northeast Tributary and into Chattanooga Creek.

Chattanooga Creek Tar Deposit: This is an area in the flood plain of the creek that contained a large amount of coal-tar constituents in a pit approximately 90 feet square. Prior to Chattanooga Creek being straightened under 38th Street, it meandered along a path next to the pit. EPA collected soil samples from the area surrounding this pit to determine if chemicals from the pit were spread out. A total of 18 soil samples were taken from locations which were approximately 200 feet apart. Results show that PAH contamination is present at varying concentrations and in no distinguishable pattern. Also found were some metals that were above background concentrations in at least one sample. These metals were: cadmium, chromium, nickel, antimony, zinc, mercury and sodium.

Sediment: EPA conducted a comprehensive sediment study in Chattanooga Creek which identified significant PAH (coal-tar constituents) contamination. Most of the contamination is between Hamill Road and Dobbs Branch (see Figure 1 attached)

Summary of Site Risks

As part of the RI/FS, EPA conducted a baseline risk assessment to determine the current and future effects of contaminants on human health and the environment. Risk assessment is a process which makes many assumptions about how people and the environment are exposed to the site's contaminants. Sampling results are used with other information to determine the risks caused by the contaminants of concern based on conservative exposure assumptions.

Contaminants of Concern

The main contaminants of concern (COCs) being addressed by this remedy are polynuclear aromatic hydrocarbons (PAHs). PAHs present in the creek bed are at concentrations that would present an unacceptable risk should chronic human exposure occur. In the current specific environmental setting, PAHs at the surface and at depth in certain sediments present significant risks, according to the human health and ecological risk assessments.

Human Health Risks

The human health risks for this site were estimated based on an assumption that people would visit the site currently and in the future, and on an assumption that the site would be developed for commercial use and future site workers would be exposed to contamination in the creek. The exposure pathways examined in the Risk Assessment were:

- ingestion of soil
- dermal contact with soil
- ingestion of sediment (in Chattanooga Creek)
- dermal contact with sediment (in Chattanooga Creek)
- ingestion of groundwater
- inhalation of volatile organic compounds (VOCs) released from ground water, and
- inhalation of dust.

The risks associated with these exposure scenarios are calculated for cancer causing chemicals (carcinogenic risks) and for other chemicals which do not cause cancer, but that have the potential to cause other ill effects (non-carcinogenic risks). The estimated risks for the areas investigated linked to Chattanooga Creek are summarized below and in Table 1 and Table 2 attached.

Groundwater near the creek: The excess lifetime cancer risk estimated for ingestion of contaminated groundwater near the creek is within EPA's acceptable target range for adults and children. Ingestion of groundwater **does not** pose an unacceptable risk.

Chattanooga Creek Tar Deposit: The excess lifetime cancer risk estimated for exposure to contaminated soil in the area of the tar deposit is within EPA's acceptable risk range. Exposure to soil in this area **does not** pose an unacceptable risk . This risk assessment was performed on the soil surrounding the tar pit. All of the heavily contaminated material was removed during the 1997 removal action.

Northeast Tributary Area: The excess lifetime cancer risk estimated for exposure to contaminated soil next to the Northeast Tributary is above EPA's acceptable target range. Exposure to contaminated soil near the Northeast Tributary **does** present an unacceptable risk to adults and children, mainly from direct contact and inadvertent ingestion.

Chattanooga Creek Sediment: The excess lifetime cancer risk is estimated to be above EPA's acceptable risk range for adults and children who visit the creek and who are exposed to contaminated sediment (between 38th Street and Dobbs Branch). Inadvertent ingestion of contaminated sediment and direct dermal contact **does** present an unacceptable risk. The creek segment between Hamill Road and 38th Street was cleaned up during the 1997 removal action.

Ecological Risks

A complete ecological assessment was performed as part of the RI/FS. EPA conducted flood plain soil, surface water, sediment, and freshwater clam tissue sampling at the site. Sediment and soil toxicity tests were also conducted using samples of sediment contaminated with coal-tar constituents collected from the creek. An earthworm bioaccumulation study was conducted using Site soil samples.

The ecological risk assessment generally concluded that plants and animals in the flood plain of the creek have not been adversely impacted. However, the ecological assessment also indicates that aquatic life in Chattanooga Creek are at risk from exposure to contaminated sediment. The sediment toxicity tests show that PAH contamination in the sediment significantly affects the survival, growth and reproduction of aquatic life in the creek.

Remedial Action Objectives

Based on the remedial investigation and the risk assessment, EPA determined that the objectives of the remedy will be to:

- prevent human exposure to contaminated soil along the Northeast Tributary and contaminated sediment in Chattanooga Creek; and,
- eliminate risks to aquatic life in Chattanooga Creek from exposure to contaminated sediment.

Scope and Role of the Remedy

As mentioned before, the overall cleanup strategy for the site was first, to address the contaminated sediment in Chattanooga Creek that was easily accessible and posed the highest health risk to people. This was accomplished through the 1997-98 sediment removal action. The second phase of the cleanup is to address the remaining contaminated portion of the creek, and the Northeast Tributary Area.

The law requires EPA to use treatment to address the principal threats posed by a site (NCP Section 300.430(a)(1)(iii)(A)). The principal threat is a source waste material at a site that is considered to be highly toxic or highly mobile, which would present a significant threat to human health or the environment should exposure occur. The coal-tar/PAH contaminated sediment at this site does not meet the definition of "principal threat," and therefore, the requirement to treat the principal threat does not apply.

Coal-tar/PAH contamination from the site and the risks associated with its exposure will be addressed through the proposed cleanup action presented in this plan.

Summary of Remedial Alternatives

Six remedial action alternatives were considered for evaluation in the Focused Feasibility Study Report. They are described as follows:

***Alternative 1*:** No Action. The law requires that the "no action" alternative be evaluated generally to establish a baseline for comparison. Under this alternative EPA would take no action at the site to prevent exposure to the contaminated sediment and soil.

***Alternative* 2:** Re-routing the Chattanooga Creek and encapsulating (solidifying) the coal-tar constituents and contaminated sediment left behind;

***Alternative 3*:** Creating an on-site landfill for the contaminated material;

***Alternative 4*:** On-site Thermal Desorption – heating the material at low temperatures to evaporate the chemicals;

***Alternative 5*:** On-site incineration – burn the contaminated material at the site to destroy the chemicals;

***Alternative 6*:** Off-site disposal and recycling – removing the contaminated material and sending it to a recycling facility.

Evaluation of Alternatives

The six remedial alternatives, including the no-action alternative were evaluated using nine criteria established by EPA. The nine criteria are defined in a box on the next page. A summary of the evaluation follows:

Overall Protection of Public Health and Environment: All the remedies meet this criteria, except Alternative 2, which keeps the contaminated material on-site and may potentially pose a future risk if the treatment fails long-term. The no-action alternative does not meet this criteria.

Compliance with State and Federal Requirements: Alternative 2 and 3 would not comply with State and Federal regulations, unless the contaminated material is treated first. All the other Alternatives meet this criteria, except the no-action alternative.

Short-term Effectiveness: All the alternatives considered (except the no-action alternative) will involve engineering controls to protect workers and residents during construction. It is not expected that any of these remedies will pose short-term health or environmental risks. However, the no-action alternative will continue to pose an unacceptable risk without treatment.

Nine Criteria for Evaluating Remedial Alternatives

1. Overall Protection of Public Health and Environment: Degree to which the remedy eliminates, reduces, or controls health and environmental threats through treatment, engineering methods or institutional controls.
2. Compliance with State and Federal Requirements: Degree to which each alternative meets environmental regulations determined to be applicable or relevant and appropriate.
3. Short-term Effectiveness: Length of construction period and the risks posed to workers and nearby residents during construction.
4. Long-term Effectiveness: Ability of a remedy to maintain protection of health and environment after the remedy is completed.
5. Reduction of Mobility, Toxicity and Volume: Degree to which the remedy reduces: the ability of contaminants to move through the environment; harmful nature of the contaminants; and, amount of contamination removed.
6. Implementability: Refers to the technical feasibility and administrative ease of implementing a remedy.
7. Cost: Benefits of a remedy are weighed against its cost.
8. State Acceptance: Consideration of the State's comments and acceptance of the preferred remedy.
9. Community Acceptance: Consideration of the public's comments and acceptance of the preferred remedy.

Long-term Effectiveness: Alternatives 4, 5, and 6 meets this standard because the waste is removed or permanently treated. Alternatives 2 and 3 do not provide the same level of protection because of uncertainties with long-term reliability of the remedy. The no-action alternative does not meet this criteria.

Reduction of Mobility, Toxicity and Volume: Alternatives 2, 3, 4, and 5 reduce the mobility and toxicity of the waste, but no significant volume reduction is achieved. Alternative 6 meets this criteria completely by eliminating the waste. The no-action alternative does not meet this criteria.

Implementability: All the alternatives can be reasonably implemented. This criteria is not a consideration for the no-action alternative.

Cost: The estimated costs to implement each remedy is as follows:

Alternative 1:	$0
Alternative 2:	$6,707,900
Alternative 3:	$6,321,600 (without pre-treatment)
Alternative 4:	$8,662,200 to $12,574,500 (depending on whether the thermal unit is direct-fired or indirect-fired)
Alternative 5:	$12,151,000
Alternative 6:	$7,479,400

State Acceptance: TDEC has assisted EPA in reviewing all technical reports produced during this investigation and has evaluated the remedial alternatives considered for this site. TDEC agrees with the proposed remedy for the site.

Community Acceptance: Community acceptance of the preferred alternative will be evaluated during the public comment period. Comments received from the community will be addressed in the Responsiveness Summary section of the Record of Decision Document.

Summary of the Preferred Alternative

Based on the results of the Remedial Investigation and Feasibility Study, EPA has determined that excavation and off-site disposal and recycling (Alternative 6) is the preferred alternative for the site. The preferred alternative provides the best balance of tradeoffs among the nine evaluation criteria, and meets the remedial goals by preventing future human contact with the coal-tar constituents and contaminated sediment in Chattanooga Creek.
This remedy was used during the first phase of the cleanup and was proven to be effective and efficient. Also, this was also the only alternative considered to completely remove the waste material from the site.

The preferred alternative will involve excavating the coal-tar constituent waste and contaminated sediment from the location where the Phase 1 Cleanup ended to the confluence of Dobbs Branch. During the Phase 1 Cleanup the following circumstances were encountered:

- all of the contaminated sediment was removed because bedrock was near the bottom of the creek bed and all of the sediment was completely contaminated; and,
- the coal-tar contamination is easily identified by visual inspection.

These conditions are expected to be encountered in the remaining portion of the creek. Therefore, it is unnecessary to establish cleanup standards for the cleanup in the creek, since all of the contaminated sediment is proposed to be removed.

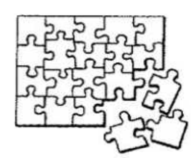
The law requires that if a remedy is selected that results in contamination remaining at the site above levels that allow for unrestricted use and unrestricted exposure, then EPA shall evaluate the remedy every five years to determine if it continues to protect human health and the environment. If the preferred alternative is selected then the five-year review will not be required.

COMMUNITY PARTICIPATION

The Comprehensive Environmental Response, Compensation and Liability Act (commonly referred to as CERCLA or the "Superfund Law") requires that EPA publish this Proposed Plan (Section 117(a)). Other public involvement activities undertaken at Superfund sites consist of: interviews with local residents and elected officials, development of a community relations plan, fact sheets, information availability sessions, public meetings, public comment periods, newspaper advertisements, site visits, Technical Assistance Grants, and any other activities needed to keep the community informed about the site and involved in the clean-up process.

To promote public involvement at the Tennessee Products site, EPA is conducting a **30-day public comment period from August 12 to September 10, 2002.** Public input on the remedial investigation, on all the alternatives considered, and on the preferred alternative is an important contribution to the remedy selection process. During this comment period, the public is invited to attend a **public meeting on August 22, 2002, at the Calvin Donaldson Elementary School, located at 927 West 37th Street, Chattanooga, beginning at 7:00 p.m.** At the public meeting, EPA will answer questions, present the Remedial Investigation results and discuss the preferred alternative for the Tennessee Products Site. Because this Proposed Plan Fact Sheet provides only a summary description of the investigation and preferred alternative being considered, the public is encouraged to refer to the Administrative Record located in the information repository for a more detailed explanation.

The public is invited to review all site-related documents housed at the information repository located at the Sallie Crenshaw Bethlehem Center, 200 West 39th Street, Chattanooga (423-266-1384). The public is also invited to offer comments to EPA, either verbally at the public meeting, which will be recorded by a court reporter, or in written form during the 30-day comment period. The final remedy selected for the site could be different from the proposed remedy, described in this Proposed Plan Fact Sheet, depending upon new information or statements EPA may receive as a result of public comments.



Public input is an important piece of the Superfund puzzle!

Please mail written comments, postmarked no later than midnight September 10, 2002 to:

Nestor Young
Remedial Project Manager
U.S. Environmental Protection Agency, Region 4
North Site Management Branch
61 Forsyth Street, SW
Atlanta, GA 30303

If you have any questions about the site, you may contact Linda Starks, Community Involvement Coordinator, or Nestor Young, Remedial Project Manager, at the address above or phone 1-800-435-9233. EPA's final cleanup decision will be recorded in a document called a Record of Decision (ROD). Public comments received by EPA will be reviewed.

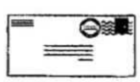
Response to comments will be included in a section of the ROD called the Responsiveness Summary. Once the ROD is signed by EPA's Regional Administrator, it will become part of the Administrative Record. The Administrative Record, located in the information repository, contains all documents used by EPA in making a final determination of the most appropriate action for the site.

The Administrative Record can be found at:

Sallie Crenshaw Bethlehem Center
200 West 39th Street
Chattanooga, TN 37409
(423-266-1384)

QUICK COMMENTS

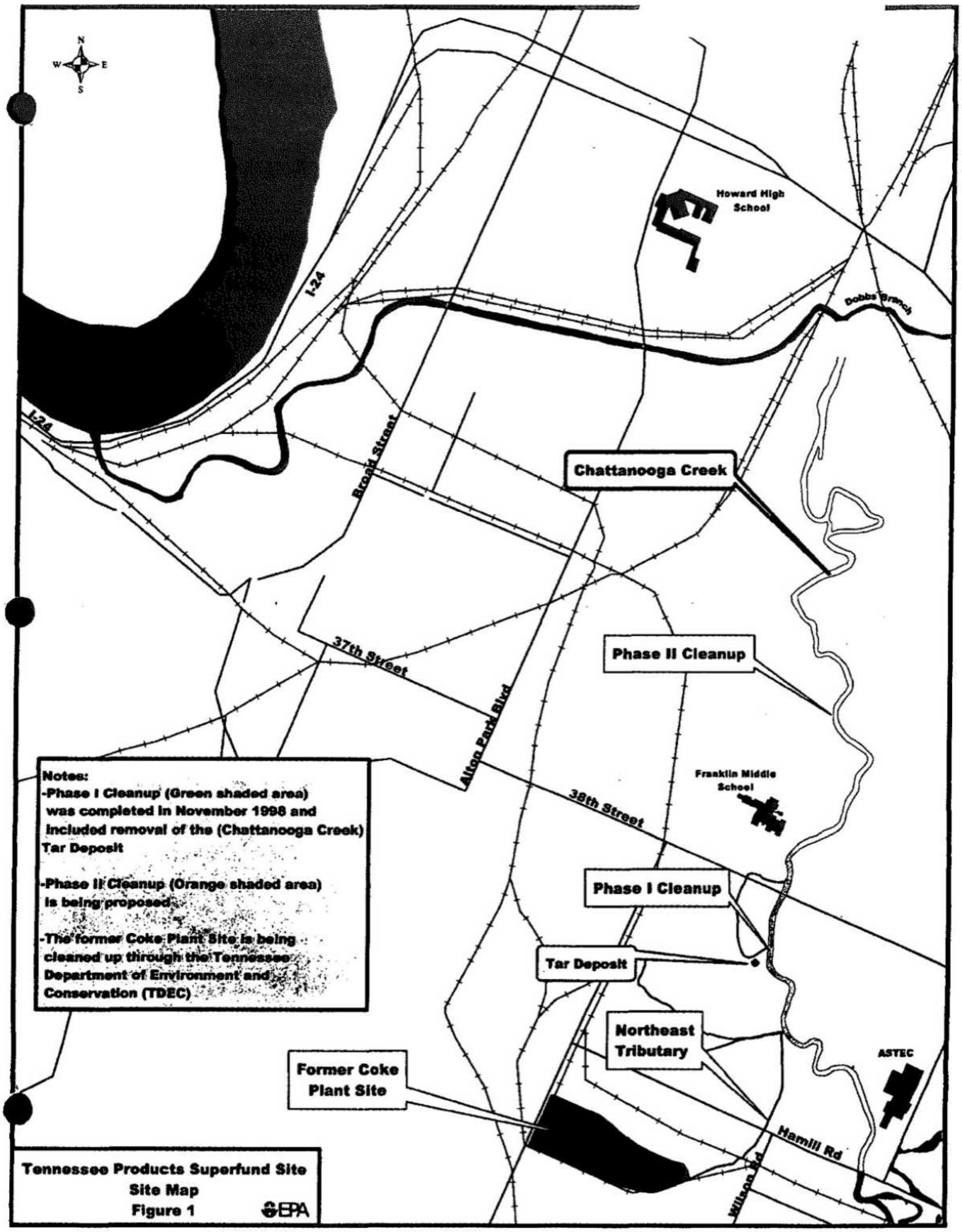
Please let us know what you think about the Tennessee Products Superfund Site cleanup. Your input is needed so that we can be responsive to the needs of the community. Please jot down your thoughts below and mail it to:



Mr. Nestor Young
North Site Management Branch
U.S. EPA, Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303

Name: ______________________ **Phone:** ______________
Address: ______________________________________

Comments: ______________________________________


N
S
W
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I-24
Howard High School
Dobbs Branch
Chattanooga Creek
Broad Street
37th Street
Alton Park Blvd
Phase II Cleanup
Franklin Middle School
38th Street
Phase I Cleanup
Tar Deposit
Northeast Tributary
ASTEC
Former Coke Plant Site
Hamill Rd
Wilson Rd
Notes:
-Phase I Cleanup (Green shaded area) was completed in November 1998 and included removal of the (Chattanooga Creek) Tar Deposit
-Phase II Cleanup (Orange shaded area) is being proposed
-The former Coke Plant Site is being cleaned up through the Tennessee Department of Environment and Conservation (TDEC)
Tennessee Products Superfund Site
Site Map
Figure 1

Table 1: Summary of Cancer and Non-Cancer Risks by Exposure Route Current Use Scenario for Chattanooga Creek Sediments								
Location	Exposure Route	Child Resident		Adult Resident		Lifetime Resident		
		Cancer[4]	HI[5]	Cancer	HI	Cancer	HI	
Upper Reach[1]	Inadvertent Ingestion	4E-07	0.02	3E-07	0.005	7E-07	0.01	
	Dermal Contact	1E-07	0.004	3E-07	0.002	4E-07	0.003	
	Total Risk	5E-07	0.03	6E-07	0.01	1E-06	0.01	
Middle Reach[2]	Inadvertent Ingestion	3E-04	0.3	3E-04	0.1	6E-04	0.1	
	Dermal Contact	3E-04	0.2	5E-04	0.1	7E-04	0.1	
	Total Risk	6E-04	0.5	8E-04	0.2	1E-03	0.2	
Lower Reach[3]	Inadvertent Ingestion	1E-06	0.01	1E-06	0.01	3E-06	0.02	
	Dermal Contact	1E-06	0.01	2E-06	0.01	3E-06	0.01	
	Total Risk	3E-06	0.03	4E-06	0.02	6E-06	0.03	

Notes:

1. The Upper Reach is the area from Burnt Mill Bridge to the RR bridge between Hooker and Hamil Roads.
2. The Middle Reach is the area between the RR bridge (between Hooker and Hamil Roads) and Dobbs Branch.
3. The Lower Reach is the area between Dobbs Branch and the Tennessee River.
4. Cancer: The cancer risk level is a probability of getting cancer over a lifetime as a result of exposure to a chemical at the particular level of exposure. The numbers mean the following: 1E-04 is one chance in 10,000; 1E-05 is one chance in 100,000; and 1E-06 one chance in a million. EPA determined that estimated cancer risks between 1E-04 (0.0001) and 1E-06 (0.000001) is acceptable, and do not necessarily indicate that a cleanup is needed.

3. HI: The Hazard Index (HI) is the sum of the Hazard Quotient for each exposure route. An HI is calculated for non-carcinogens to assess whether health problems, other than cancer, might be associated with a Superfund site. If the number is greater than 1.0 then the chemical may pose some risk to human health.

Table 2: Summary of Cancer and Non-cancer Risks by Exposure Route for the Northeast Tributary Area[1]

Exposure Route	Estimated Risk					
	Current Use Scenario for a Site Visitor		Future Use Scenario for a Site Visitor (property developed for commercial use)		Future Use Scenario for a Site Worker (property developed for commercial use)	
	Cancer[2]	HI[3]	Cancer	HI	Cancer	HI
Inadvertent Ingestion of Soil	1E-04	0.03	1E-04	0.03	2E-03	0.2
Dermal Contact with Soil	2E-04	0.04	2E-04	0.04	1E-03	0.1
Inhalation of Dust	2E-08	0.000001	2E-08	0.000001	6E-07	0.00002
Inadvertent Ingestion of Surface Water	2E-06	0.1	2E-06	0.1	NA	NA
Dermal Contact of Surface Water	5E-04	0.5	5E-04	0.5	NA	NA
Inadvertent Ingestion of Sediment	4E-05	0.1	4E-05	0.1	NA	NA
Dermal Contact with Sediment	7E-05	0.03	7E-05	0.03	NA	NA
TOTAL RISK	**9E-04**	**0.7**	**9E-04**	**0.7**	**3E-03**	**0.4**

Notes:

1. The Northeast Tributary Area consists of a mound of contaminated soil next to the Northeast Tributary of Chattanooga Creek.
2. Cancer: The cancer risk level is a probability of getting cancer over a lifetime as a result of exposure to a chemical at the particular level of exposure. The numbers mean the following: 1E-04 is one chance in 10,000; 1E-05 is one chance in 100,000; and 1E-06 one chance in a million. EPA determined that estimated cancer risks between 1E-04 (0.0001) and 1E-06 (0.000001) is acceptable, and do not necessarily indicate that a cleanup is needed.
3. HI: The Hazard Index (HI) is the sum of the Hazard Quotients for each exposure route. An HI is calculated for non-carcinogens to assess whether health problems, other than cancer, might be associated with the site. If the number is greater than 1.0, then the chemical may pose some risk to human health.